

THE NATIONAL LIBRARY OF MEDICINE

FIVE-YEAR PROGRAM PLAN

APRIL 1966

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FIVE-YEAR PROGRAM PLAN

April, 1966

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

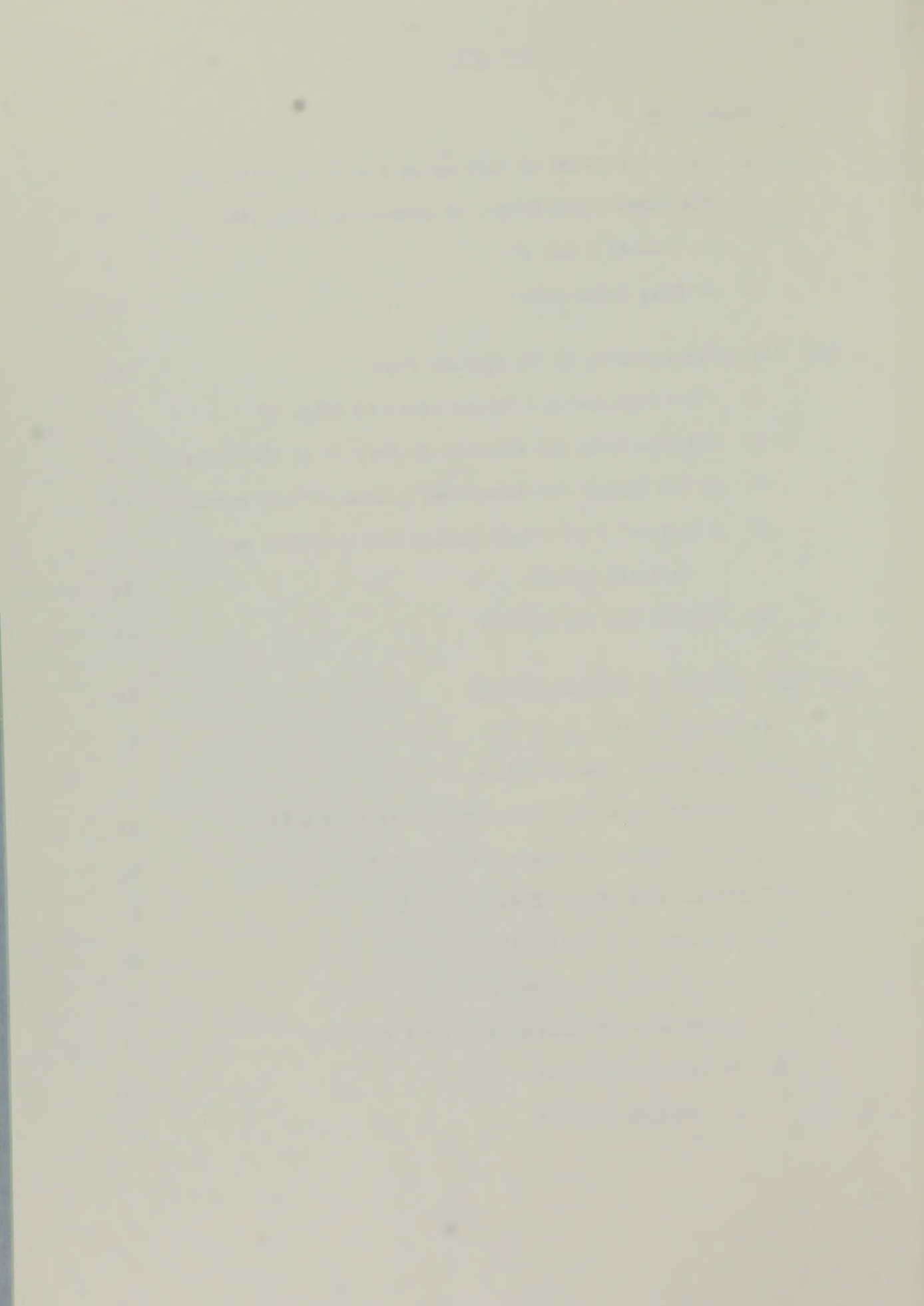
Public Health Service

National Library of Medicine

Bethesda, Maryland

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INTRODUCTION

I. INTRODUCTION

The knowledge explosion of recent decades has made a dramatic and profound impact on society. Scientific progress has brought about a revolution in the nature and scope of information requirements. Advances in communications technology afford the capability of satisfying these requirements. Implementing this capability necessitates the development of new, or modification of existing, institutions to facilitate the servicing of information in new forms and at new levels.

In the field of the health sciences and their application to health programs, the Public Health Service has a central responsibility. The National Library of Medicine of the Public Health Service has a congressional mandate^{1/} to apply its information resources broadly to the advance of the health sciences.

The Library's Board of Regents, exercising its duty^{1/} "to advise, consult with, and make recommendations to the Surgeon General on important matters of policy in regard to the Library," in November 1965, submitted to the Surgeon General an Advisory Report on Policy. (Appendix A.) The Surgeon General approved, in principle, the Board's recommendations for a bold and vigorous role for the Library in accelerating the dissemination of biomedical information to serve the needs of the three principal health-related communities: research, practice, and education, including continuing education.

The Board of Regents has called upon the Library to institute broadened programs of collecting, organizing, processing, and distributing information related to human health. The Board views the Library as the heart of a national biomedical information system and urges the Library to function as both the central resource and the leader in the development of a national biomedical communications network under the Medical Library Assistance Act. The Board further urges that the NLM service and coordinate the specialized information centers which meet categorical health information needs.

The NLM has a clear responsibility to identify areas of need, and to initiate programs in active cooperation with scientific, educational, and professional groups concerned with the advancement of medical and related sciences.

The programs that the NLM will expand, and the new programs that will be instituted during the next five years, and beyond, transcend the traditional research library function of "passive-response" to seekers of information. The NLM will exercise active leadership in solving the communications problems created by the biomedical knowledge explosion.^{2/}

With the addition of new dimensions to the Library's traditional role, the NLM becomes an equal participant in the national effort to advance medical and related health services for improved total health of the people of the United States and the world.

A. The NLM Mission as Defined by Statutory Authority

1. The National Library of Medicine Act of 1956 (P.L. 84-941) directs the Library "To assist the advancement of medical and related sciences, and to aid the dissemination and exchange of scientific and other information important to the progress of medicine and to the public health."
2. The Medical Library Assistance Act of 1965 (P.L. 89-291) authorizes the Library to support the construction and expansion of medical libraries; to support the development and expansion of medical library resources and technology; to support the conduct of research and development in health-related library science; to support the training of medical librarians and other information specialists in the health sciences; and to support biomedical scientific publications. The Act introduced a sense of urgency. The Congress noted that volumes of information in the health sciences will be lost "unless proper measures are taken in the immediate future to develop facilities and techniques necessary to collect, preserve, store, process, retrieve, and facilitate the dissemination and utilization of, health science knowledge and information."
3. Section 301 of the Public Health Service Act, P.L. 78-410, authorizes the Surgeon General (and through delegation by the Surgeon General to the Library) to award research fellowships

and traineeships, and to make grants-in-aid relating to library-based programs in health communications.

B. The Communities Served by Biomedical Libraries

"Medicine," as defined by the National Library of Medicine Act, includes "preventive and therapeutic medicine, dentistry, pharmacy, hospitalization, nursing, public health and the fundamental sciences related thereto, and other related fields of study, research, or activity."^{3/} Within these broad categories are approximately 3,000,000 persons,^{3/} engaged in more than forty occupational pursuits,^{4/} (Tables 1 and 2 reflect the major components) who comprise the health-related communities of users served by NLM and other medical libraries. These communities represent the fields of research, education, and practice. The information activities provided for in this plan are assumed to be those required by the occupational groups involved in the national health effort. What they need to accomplish their purposes, whether for education, practice, or research, defines biomedicine for the purpose of this plan..

At any given time, the NLM must be prepared to provide quality service in response to the needs of the health-related communities. Recently, for example, the Library has been devoting special attention to the demands of health practitioners for access to new knowledge.

Table 1 Estimated manpower in selected health occupations: 1950, 1960, and 1962-63

Health occupation ¹	1950	1960	1962 or 1963
Medical occupations.....	608, 500	817, 200	-----
Physicians (M.D.) ²	220, 000	260, 500	276, 500
Physicians (D.O.) ²	12, 700	14, 300	12, 700
Administrators, hospital and other.....	8, 600	12, 000	12, 500
Chiropractors.....	20, 000	25, 000	25, 000
Dietitians and nutritionists.....	22, 000	26, 000	28, 000
Educators, health.....	600	1, 000	1, 200
Medical secretaries and office assistants.....	70, 000	80, 000	-----
Medical laboratory technologists-technicians.....	30, 000	68, 000	-----
Medical record librarians.....	4, 000	8, 000	9, 000
Medical record technicians.....	8, 000	20, 000	23, 000
Medical X-ray technologists-technicians.....	30, 800	70, 000	-----
Opticians and optical laboratory mechanics.....	19, 200	20, 300	21, 000
Optometrists.....	17, 800	17, 300	17, 000
Pharmacists.....	101, 100	117, 000	117, 400
Podiatrists.....	7, 100	7, 600	8, 000
Psychologists, clinical and other health.....	3, 000	8, 000	8, 500
Rehabilitation counselors.....	1, 500	3, 000	5, 000
Social workers, medical and psychiatric.....	6, 200	11, 700	15, 000
Social scientists, health (anthropologists, economists, sociologists, etc.).....	(³)	(³)	500
Statisticians and analysts, health.....	2, 000	5, 000	-----
Therapists, occupational.....	2, 000	8, 000	8, 000
Therapists, physical.....	4, 600	9, 000	12, 000
Therapists, speech and hearing.....	1, 500	5, 400	10, 200
Veterinarians ²	15, 800	20, 100	21, 600
Dental occupations.....	170, 400	221, 900	228, 500
Dentists ²	87, 200	101, 900	105, 500
Dental assistants, dentist's office.....	55, 200	82, 500	84, 000
Dental hygienists.....	7, 000	12, 500	14, 000
Dental laboratory technicians.....	21, 000	25, 000	25, 000
Nursing occupations.....	733, 500	1, 087, 300	1, 188, 900
Professional nurses.....	375, 000	504, 000	550, 000
Practical nurses.....	137, 000	206, 000	225, 000
Aides, orderlies, and attendants.....	221, 000	375, 000	410, 000
Homemakers, home health aides.....	500	2, 300	3, 900
Environmental health occupations.....	11, 600	22, 300	28, 000
Sanitary and health related engineers.....	6, 000	8, 000	9, 000
Sanitarians.....	5, 000	11, 000	14, 000
Radiological health specialists, including health physicists.....	(³)	2, 000	3, 000
Industrial hygienists.....	600	1, 300	2, 000
Health research occupations.....	7, 000	28, 000	-----
In the biological sciences, mathematics, physical sciences, and engineering.			

¹ Estimates not available for personnel in food and drug protective services, health information and communications, medical engineering and electronics, and orthopedic and prosthetic appliance work.

² Total personnel, active and inactive. Other estimates are for active personnel only.

³ Fewer than 500.

⁴ Excludes about 11,000 physicians, veterinarians, and dentists engaged in research, who are included in the totals for these professions.

Source: "Health Manpower Source Book No. 18." *Manpower in the 1960's*. PHS Publication No. 263.

Table 2 Estimated manpower in 5 major health fields: 1950 and 1960

Health field	1950		1960	
	Number	Percent	Number	Percent
Total.....	1, 531, 000	100. 0	2, 176, 700	100. 0
Medical.....	608, 500	39. 7	817, 200	37. 5
Dental.....	170, 400	11. 1	221, 900	10. 2
Nursing.....	733, 500	47. 9	1, 087, 300	50. 0
Environmental.....	11, 600	. 8	22, 300	1. 0
Research.....	7, 000	. 5	28, 000	1. 3

NOTE: In the 10-year period there was a 42-percent gain in personnel. Manpower in the medical and dental fields each increased by about one-third in numbers; in nursing about half. Personnel in environmental health occupations doubled, while scientists in health research (excluding physicians, veterinarians, and dentists) increased fourfold.

Source: "Health Manpower Source Book No. 18." *Manpower in the 1960's*. PHS Publication No. 263.

C. Working Principles:

1. The ultimate purpose to be served through improved access to information is improved health for the American people. The institutions, practices, networks discussed herein are not the end beneficiaries, but only the intermediate mechanisms through which the payoff benefits of new medical knowledge may be realized.

2. Major expansion and extension of existing information systems and library resources will be required to satisfy increasing information needs. This will be accomplished during the next five years by means of a Bio-medical Library Network serviced by an expanded centralized NLM function. These plans are outlined in Section II A and B, and detailed in Sections III and IV. These programs will be expansions and extensions of existing systems and services and will take advantage of the latest technological capabilities.

3. New communications technologies must be studied, tested and applied to the existing biomedical information system. This will be accomplished in a new NLM research and development facility, Center for Biomedical Communications. The Center's programs are outlined in Sections II C and D and Sections IV and VI, and are described in the broadest possible manner inasmuch as technological capabilities in five years are expected to change dramatically. These programs will be oriented toward the development of new learning resources during the next five years and will become an operational activity in FY 1972.

4. The expansion and extension of existing facilities and the development of major research and facilities resources for new information systems will meet a significant portion of needs in FY 1971 and will provide a new base for planning to respond to future demands.

5. No information system or network is or can be self-contained. Just as recorded scientific communication can be considered as a part of all communication, so the medical libraries on which the retrieval is built can be regarded as a specialized link of university and research libraries. The total biomedical library network can be considered as a major part of a national system for scientific and technical information.

6. The information requirements of the health sciences relate to all areas of human inquiry. The NLM five-year plan is concerned with the broadening of subject coverage within the medical library system to meet the actual needs of health workers. The plan is designed to accommodate changes in user demands as well as the changing character of the information itself.

While the scope of the medical libraries' collections will continue to be broadened, the plan calls for the development of relationships throughout the national system for scientific and technical information to ensure the users of access to all information.

7. The development of the network plan is projected on the basis of existing legislative authorities. The plan recognizes existing foundations on which regional resources may be built and the NLM's ability to provide the expansion of centralized resources to effectively service the network. The chief objective of the plan for network development is to provide equal access to biomedical information for all health professions.

8. The plan is predicated on a cooperative financial as well as intellectual effort between government and academic and private institutions and organizations. It envisages leadership by NLM to provide guidance and support to ensure uniform standards without restrictive controls.

9. The increasing requirements of the health professions for continuing education have a significant effect on health-science libraries. This plan recognizes the need for medical libraries to function as teaching and learning resources employing new modalities for information transfer. The assumption by biomedical libraries of a more active role in both graduate and continuing education is one of the principal objectives of the NLM five-year program plan.

10. Accurate projection of future volumes of biomedical information is difficult since each medical breakthrough stimulates production of additional information. Neither present user needs nor projections of the extent of future user needs can be ascertained with any degree of precision. The NLM five-year plan is designed to encourage growth and development of a biomedical library system which will be capable of continuing to satisfy predictable user needs while at the same time implementing the emerging new modulation of information handling to accommodate future needs. Thus, the NLM anticipates that in five years, a plateau will be reached at which time evaluations will provide a new basis for planning.

PRINCIPAL ELEMENTS OF THE PROGRAM PLAN

II. PRINCIPAL ELEMENTS OF THE PROGRAM PLAN

A. A National Medical Library Network

This is a program to utilize the Library's existing resources and those provided by the Medical Library Assistance Act to develop a national network of biomedical libraries and information centers. The network, as shown on Fig. 1, comprises the NLM as a central resource, regional medical libraries, local medical libraries, and specialized information centers. It is designed as an expansion and extension of existing resources, supplemented by new facilities in areas of need, to provide equal access to users throughout the biomedical community.

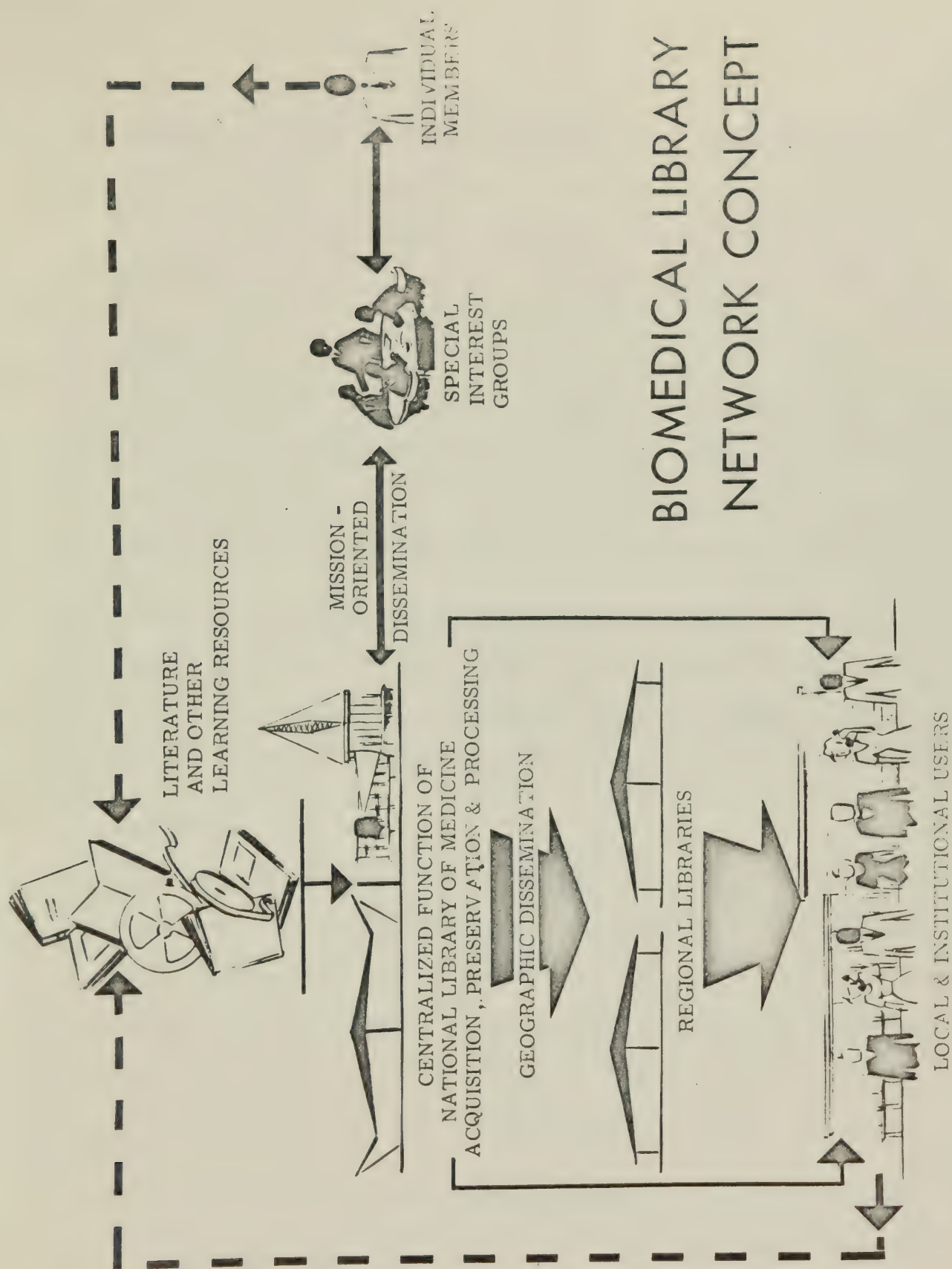
Objective:

To improve the dissemination of published medical information (books and journal articles) and other learning resources (films, audio and video tapes, etc.) through the development of a national document processing and dissemination network for the biomedical sciences. This network will: (1) provide rapid and equal access to biomedical information through national, regional, and local library resources for local requirements; (2) meet interdisciplinary needs of a national character through categorical programs linked to agencies such as information centers.

B. The NLM Functions and Services in Support of the Network

The service programs in the NLM Bethesda facility represent the core activity responding to the information requirements of the biomedical community. Traditional library programs (e.g. acquisitions and cataloging,

SYSTEM INPUT



BIOMEDICAL LIBRARY NETWORK CONCEPT

Fig. 1

preservation of the collection, reference and interlibrary loan) together with new programs geared to new technology (e.g. MEDLARS and other automated systems), constitute a central resource for the Nation's university-based medical and other health science libraries.

Objective:

To continue to provide essential services and leadership to the network, by expanding, accelerating, and improving the quality of its traditional services; by redefining and expanding its new programs; and, by implementing even newer programs utilizing the most advanced technology.

C. An NLM Center for Biomedical Communications Research

This will be a new facility located on a site outside Washington, D.C., where it will be readily accessible to both a strong medical complex and the expertise of industry (electronics and systems engineering firms).

Objectives:

(1) to provide facilities for research and development in information science and communications related to medicine; (2) to provide a base for developing new tools and testing new techniques to be used in systems of continuing education for health practitioners; and, (3) to provide regional library services, including the distribution of continuing education materials to the surrounding geographic area.

D. A National Health Information Clearinghouse and Referral System

This will be a new program which will function as a clearinghouse and

referral center for information relating to all systems, programs, resources, and projects concerned with the acquisition, processing, and dissemination of biomedical information.

Objective:

To enhance and supplement access to unpublished informational materials, including the dissemination of non-print materials for continuing education. The clearinghouse will maintain files of unpublished health information such as bibliographies, translations, and reports.

This referral system will collect information relating to other information systems, projects, and resources, both in biomedical sciences and in related scientific fields, and will respond to requests for information on these subjects. It will thereby provide a single point of entry and inquiry to any system concerned with the processing and dissemination of biomedical information.

E. Support for the Network

Under the authority of the Medical Library Assistance Act the National Library of Medicine will provide support for:

1. health science library construction;
2. improving and expanding basic library resources;
3. research and development
4. manpower development
5. publications
6. development and continuing operation of regional medical libraries.

Objective:

To assist in the strengthening and modernization of the existing medical library system by providing support for facilities, resources and manpower; to assist in the development of an efficient biomedical library network which will be able to respond to the requirements of the biomedical community with quality and speed.

THE BIONEDICAL LIBRARY NETWORK

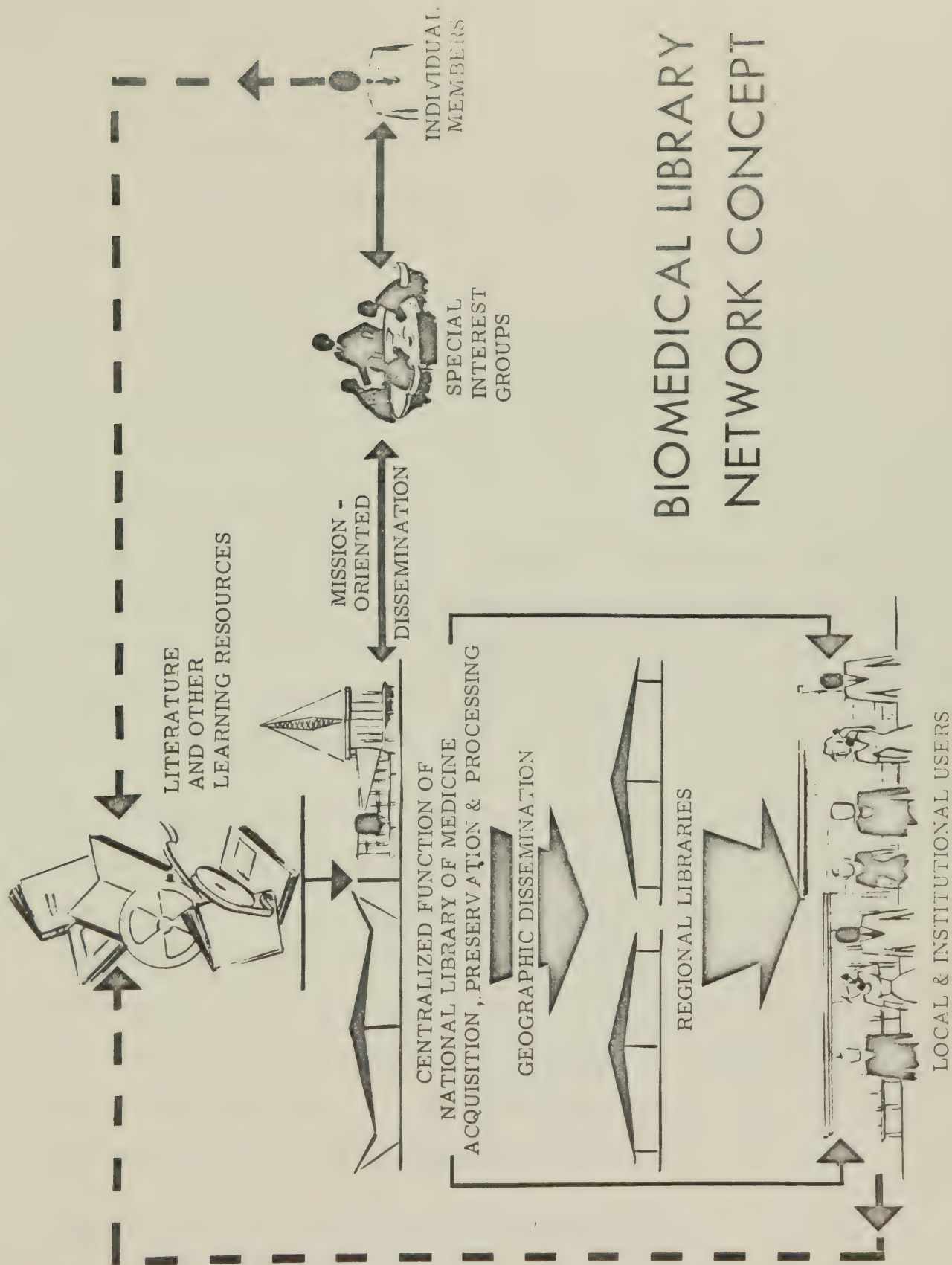
III. The Biomedical Library Network

For many years the National Library of Medicine and the Nation's medical libraries have comprised an informal biomedical library system.^{5/} The impact of new knowledge, generated by accelerated health research, has imposed so many new responsibilities upon the existing system that the system now is overloaded and in danger of breaking down. It has become obvious that, if these responsibilities are to be carried out, the existing informal system must evolve into a smoothly operating formal service network with modern facilities utilizing new technologies.^{6/7/} Such a network must have the capability of acquiring all biomedical information, organizing it, and making it rapidly accessible to users anywhere, at any time.

The NLM five-year program design calls for a network which will efficiently acquire and provide rapid dissemination of published literature, unpublished materials, bibliographies and indexes, and other learning resources. The network will consist of four basic interconnected elements: (Fig. 1)

1. The National Library of Medicine (including its Center for Biomedical Communications and National Health Information Referral Program) - serving as a central resource for acquisition, preservation and distribution of all textual and informational materials related to health;
2. Regional Medical Libraries - providing backup services to local libraries on a wide geographic basis. These libraries should have the capability of responding to 90% of the user requests;^{5/8/}

SYSTEM INPUT



LOCAL & INSTITUTIONAL USERS

Fig. 1

3. Local Libraries - including university medical school libraries, teaching and community hospital libraries, medical society and free-standing libraries. These facilities should have the capability to serve as major learning resources within the community served.
4. Specialized Information Centers - providing comprehensive information services in a particular subject area to special-interest groups.^{9/}

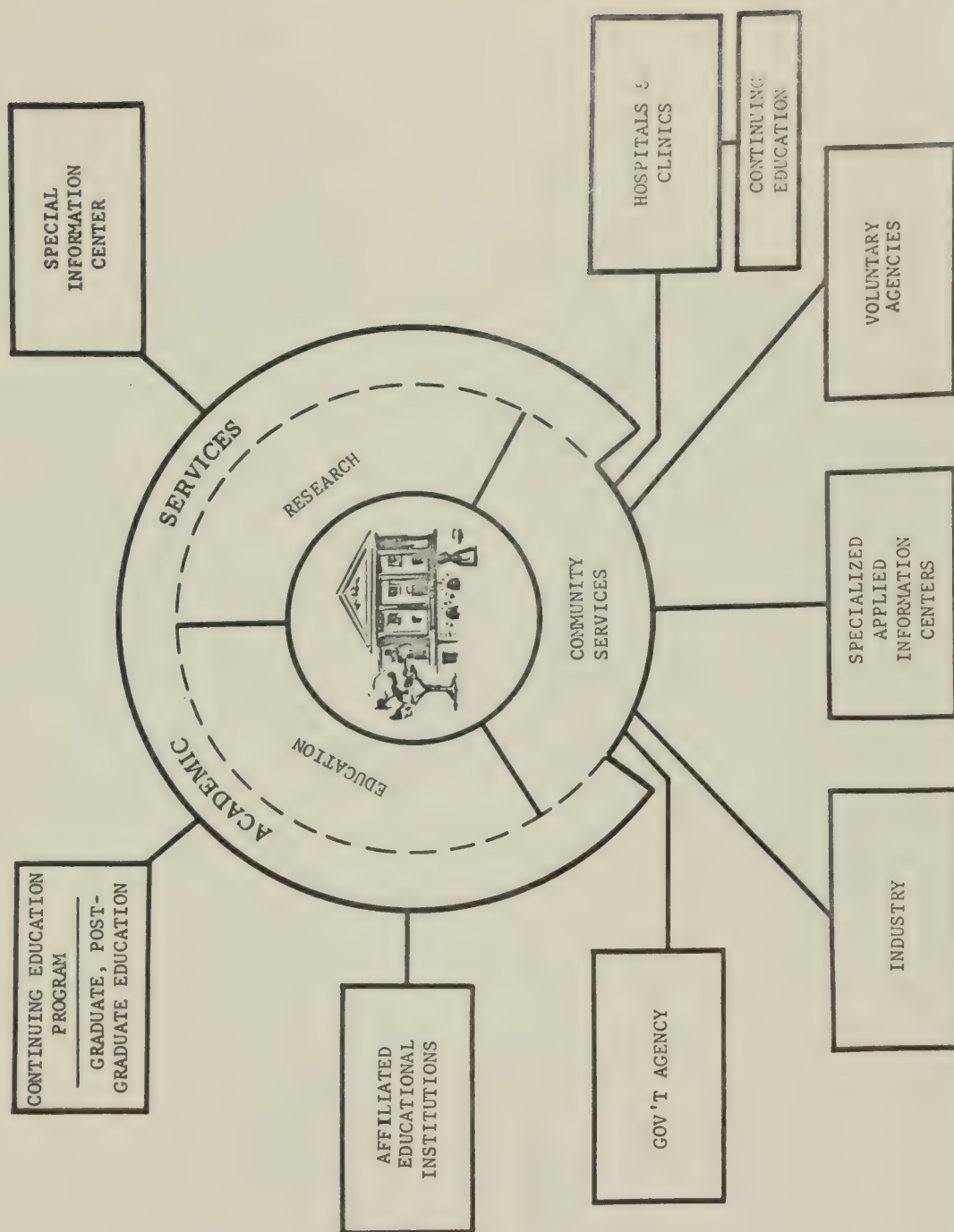
A. Network Concept

The biomedical library network will depend for its success on the service functions of local units. The regional libraries and the NLM constitute resources facilitating more effective performance at local levels. Two types of local units predominate, the one university-based (Fig. 2), the other free-standing. (Fig. 3)

The university-based medical library has educational and research support responsibilities to the university community.^{10/} It has also, in some cases by state law, in others by tradition, accepted a share of responsibility -- over and beyond customary library cooperation -- for services to a medical community, local, state or regional. Acceptance of responsibility for community library services is a reflection of an active development among universities and their medical schools today -- increased services to a non-university community.

Primarily, the free-standing library, whether supported by a medical society or by an independent hospital, provides services to a membership

BASIC LOCAL ACADEMIC UNIT OF BIOMEDICAL INFORMATION NETWORK



BASIC LOCAL NON UNIVERSITY UNIT OF BIOMEDICAL INFORMATION NETWORK

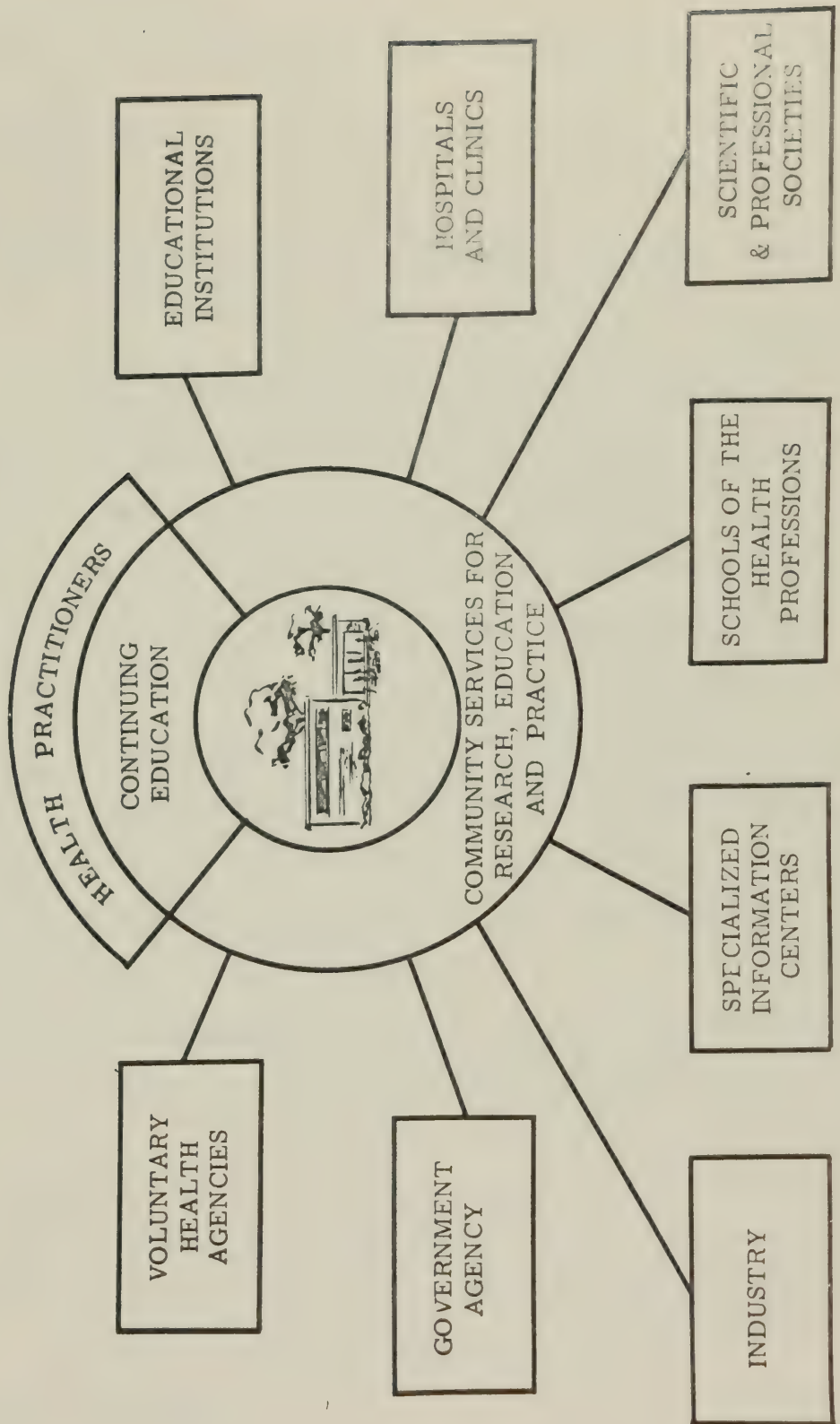


Fig. 3

group composed of health practitioners. It also provides community services (frequently by contractual arrangements to augment its income).^{11/}

The biomedical library network will be developed by expansion of community services with government support so as to guarantee that any individual or institution concerned with the national health effort, wherever he may be located, can have access to medical library service.

Basic input to the system will include the world's published, as well as unpublished, medical information, in addition to other learning resources. The National Library of Medicine will continue its traditional function as a central collecting and switching mechanism by comprehensively acquiring materials and processing them for the widest possible dissemination. Distribution at the local level will be accomplished in two ways:

1. Information and other learning resources will be distributed geographically through a network of regional libraries serving local institutions and individual users. When practical, data communications equipment will be used to speed the flow of information throughout the network.^{12/}
2. Materials will be repackaged for specialty groups to meet the particular needs of a subject field of institutional mission.

B. Geographic Dissemination

Access to the network's information holdings by users in the biomedical community is graphically presented in Figure 4. The user community consists of:

1. Research workers at universities, research institutes, and industrial establishments;

GEOGRAPHIC DISSEMINATION

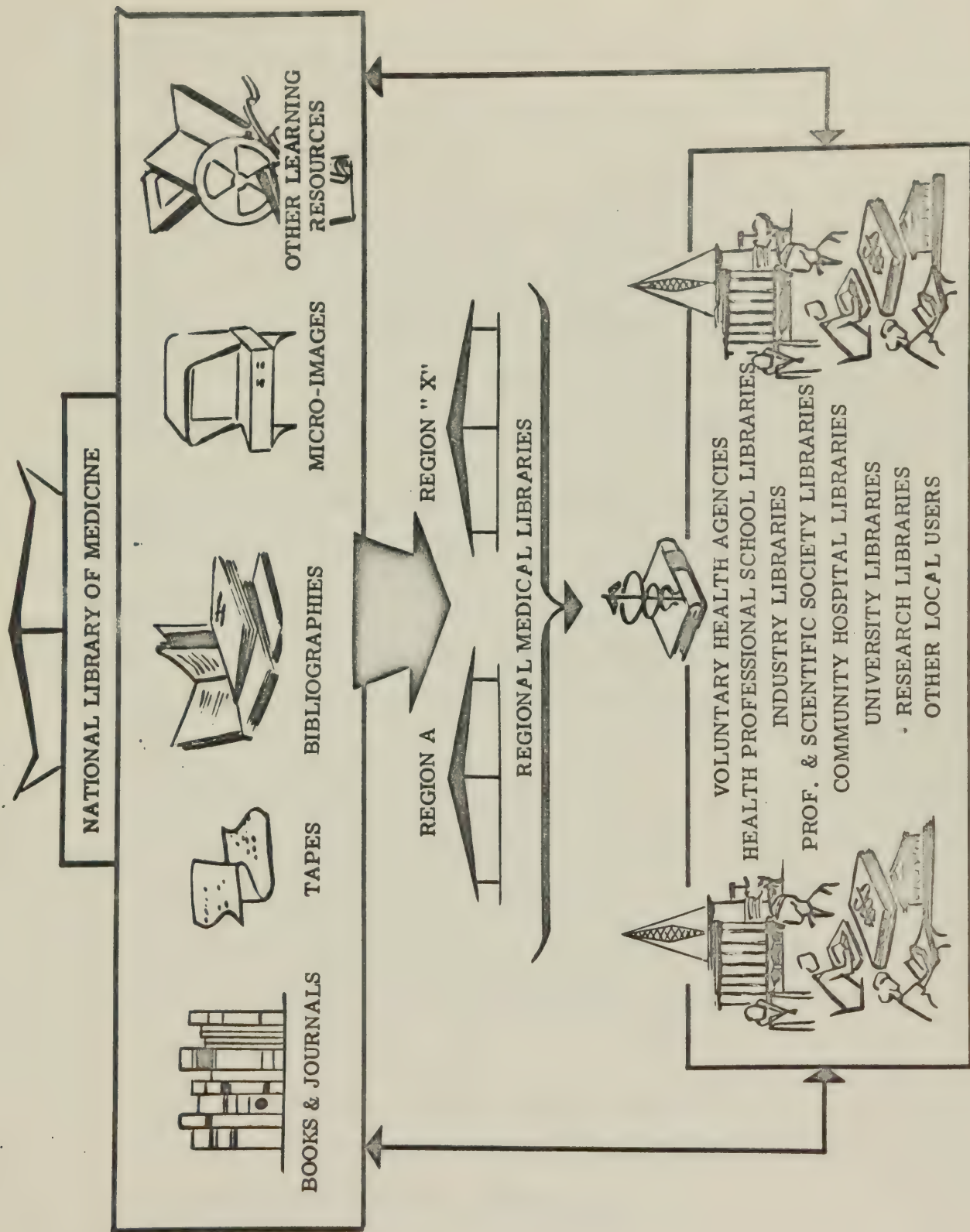


Fig. 4

2. Teachers and students at medical and other health profession schools, and related institutions;
3. Health practitioners.

Primary access to the system would be through the local library (school, hospital, professional society, state extension service). In the near future, entry to the system should be possible by local terminals and dataphone linkages.^{12/} The local library should be adapted to meet user needs rather than compel users to conform to existing service patterns.

The NLM will periodically update the information stores of the regional medical libraries with bibliographic data in electronic form, printed bibliographies, microforms of selected publications which are not commercially available, and other learning resources. The regional medical libraries will be responsible for furnishing local institutions with:

1. Literature searches by computer;
2. Computer generated current-awareness listings;
3. Complete documents, or, when available, abstracts of the original documents in either hard copy or microform;
4. Other learning resources; audio-visual materials;
5. Reference services;
6. Training and orientation of medical librarians;
7. Research and development in information handling; and
8. Support to specialized information centers.

Eventually, as demand dictates and technology and funds permit, the regional libraries will have direct electronic linkages to key institutions in their regions.^{12/} Local connecting equipment on consoles or terminals will enable direct interrogation of the bibliographic data base in the regional computers. The local institutions should be able to provide both current awareness for individual laboratories or departments and demand search services to their own users.

The Medical Library Assistance Act authorizes a program of grants to institutions to enable them to broaden responsibilities and to function as regional medical libraries. Grants will be available for: acquisition of books, journals and other library resources; cataloging, binding, and other processing procedures; acquisition of equipment to facilitate the use of the resources; the acquisition of mechanisms and the employment of personnel for the speedy transmission of materials and information between the regional and the local libraries served by it; and necessary construction, renovation, rehabilitation, or expansion of their facilities. Grantee institutions, functioning as regional medical libraries, would be required to expand and modify their resources to provide supportive services and to agree to provide free loan service and materials to qualified requesters.

In the early period of the establishment of the regional libraries, those institutions receiving grant support will serve also as laboratories for the testing of devices and procedures for eventual incorporation into the total network.

C. Mission-Oriented Dissemination

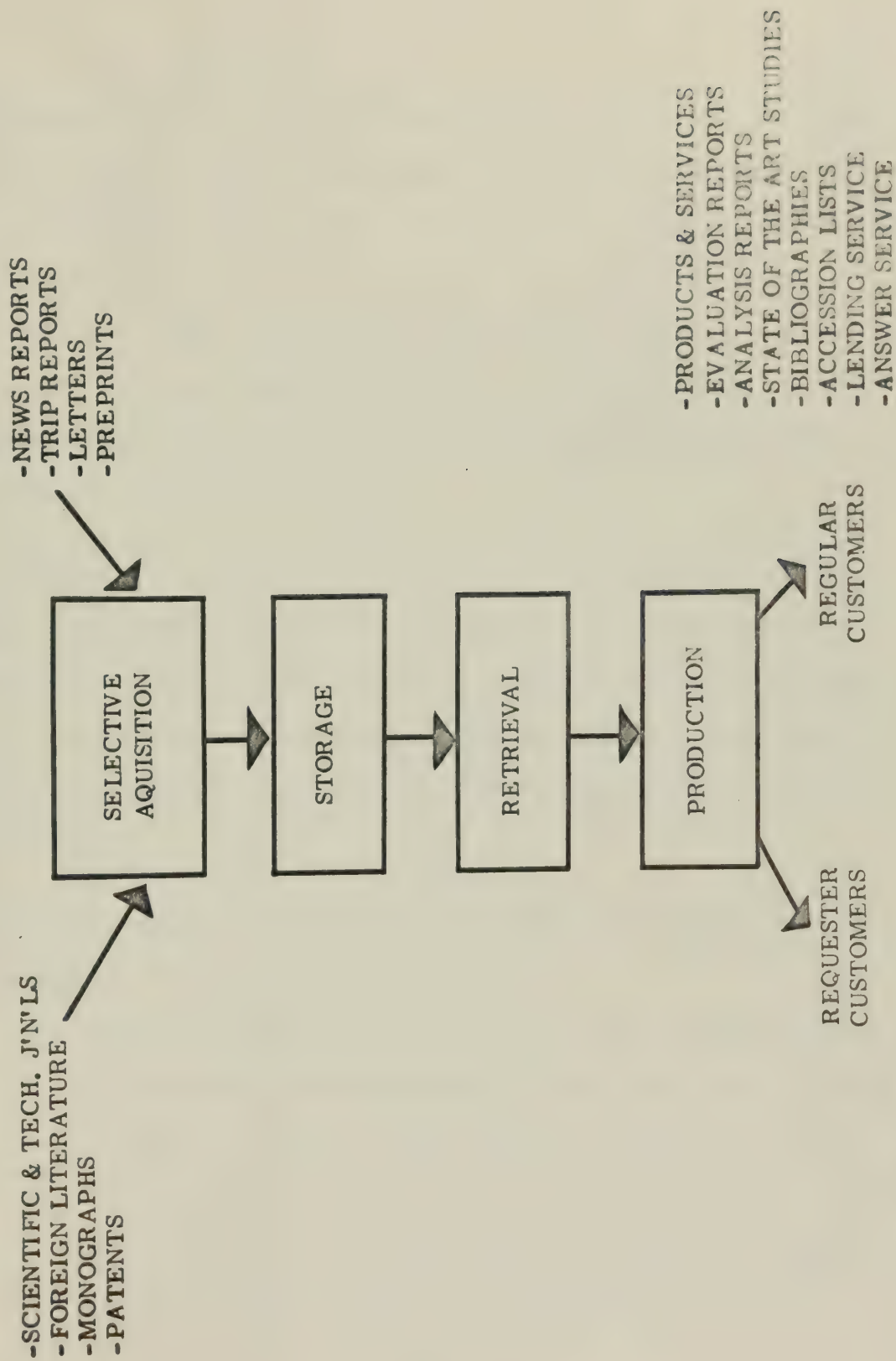
A prominent feature of science today is the reorganization of the communities concerned into new interdisciplinary groups for the purpose of investigating categorical or mission-related problems.^{13/}

The fields are usually new and under rapid development. There is a requirement not only to monitor the generation of new information bearing on the problem, but also to integrate it, and to synthesize new knowledge to provide meaningful patterns for further work.

Such functions call for the participation of scientific personnel in the processing, analysis and synthesis of information, and have given rise to new specialized information programs.^{13/} Prominent among these is the creation of specialized or "mission-oriented" information centers. Figure 5 shows how such centers handle information.

Current criticism of the inadequacies of information systems in the sciences^{14/} is not without foundation. But before it is possible to reply to the critics with ready-to-implement corrective action, the factors causing the deficiencies must be isolated and understood. Critical studies of user requirements represent a major problem area.^{15/} Mission-oriented science has created fundamental changes in the requirements

FUNCTIONAL DIAGRAM OF SPECIAL SCIENTIFIC INFORMATION CENTER



(Adapted from: G. S. Simpson, Jr.)

Fig. 5

for information services. Traditional information services no longer respond properly to the changing demands of highly specialized users.^{9/}

In the biomedical sciences the new requirement to organize and service information by mission is being met by uncoordinated efforts. To satisfy these needs, the biomedical community is creating new specialized information programs which are oriented to a special disease or health program category and are called specialized or "mission-oriented" information service centers.^{13/}

The co-existence of traditional, academically-oriented institutions with the new mission-oriented information service centers presents a challenge. Resources should not be unnecessarily duplicated and functions require sharper delineation. Libraries and specialized mission-oriented services must reinforce each other's functions without duplicating them.

The following general principles underlie the NLM's approach to this relationship:

- (1) Mission-oriented information centers have a primary function of evaluating and synthesizing both published and unpublished information bearing on their missions or categorical areas.
- (2) It is the NLM's responsibility to provide the primary materials which the mission-oriented information centers will analyze, evaluate and distribute to their clients.

- (3) Mission-oriented information centers provides a secondary screening or indexing in depth whenever such service is an essential mission requirement. Depth indexing should be derivative from and compatible with the primary vocabulary (the NLM's MeSH, Medical Subject Headings^{16/} list). The vocabulary and nomenclature itself will be developed by these centers.
- (4) Mission-oriented information centers are intended to serve a national audience rather than a local one.

In most instances mission-oriented information centers will be serviced directly from literature resources by nearby regional medical libraries, and with search services by decentralized MEDLARS units (IV, F, 2). An operational example is the current relationship between the MEDLARS Center at the University of California at Los Angeles and the Brain Research Information Center,^{17/} where the UCLA library is searching MEDLARS tapes furnished by the NLM, and producing magnetic tape files of citations of special interest to the Center. Selected citations are then re-worked as the Center may require to provide increased depth of indexing. The Center uses this retrieval capability and copies of the literature as a base for review papers. Considerable effort will be devoted to the compatibility of microthesauri required by specialized centers with the NLM's Medical Subject Headings list.

Other mission-oriented users of bibliographic services (Fig. 6) are directly served by the NLM. They are considered broadly as two categories:

MISSION-ORIENTED DISSEMINATION OF BIBLIOGRAPHIC INFORMATION

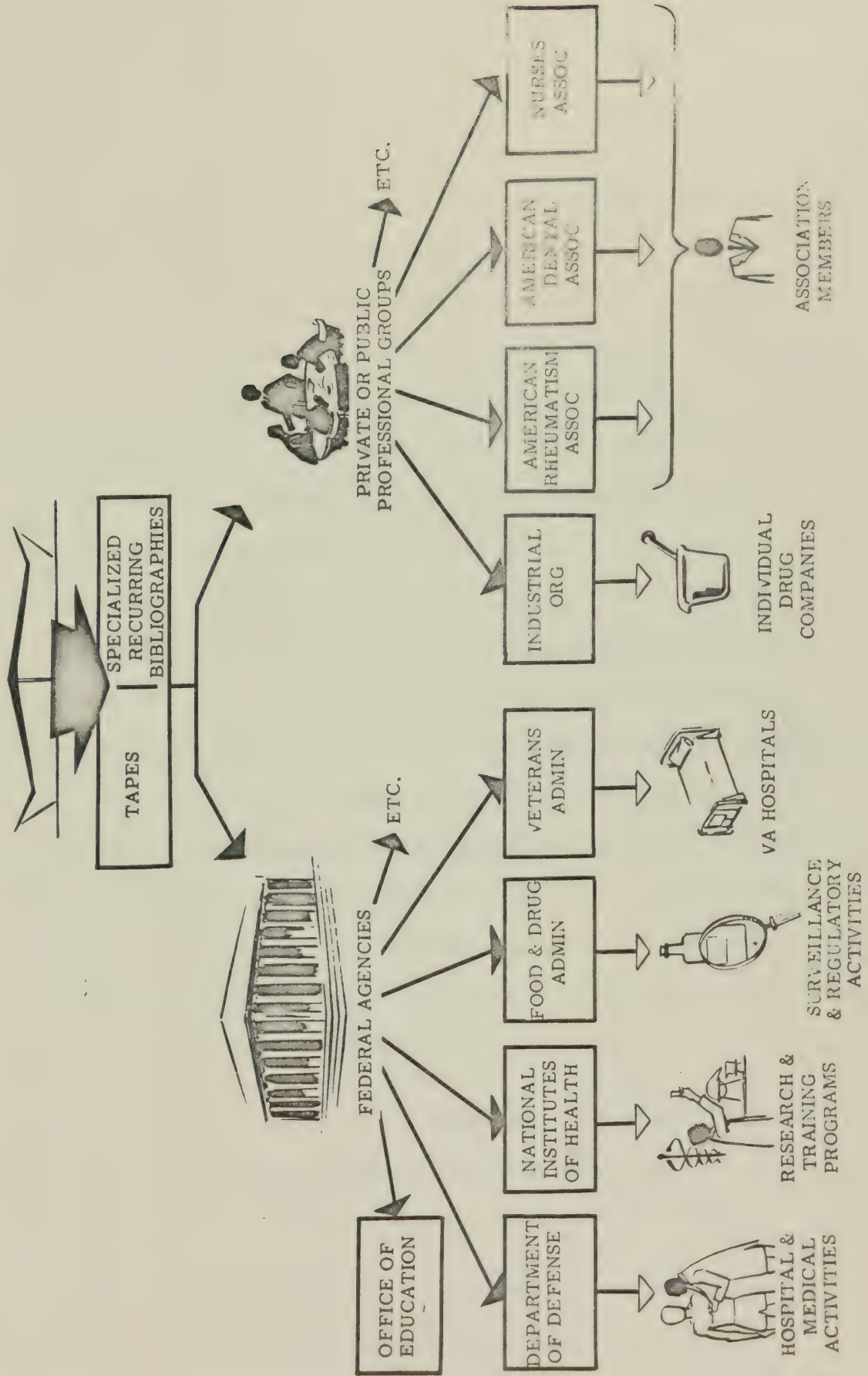


Fig. 5

(1) Federal Agencies

Tapes from MEDLARS constitute a resource which can be used by different agencies to provide current awareness and demand searches for the specific purposes of the agency. The NLM is now developing similar relationship with the National Institutes of Health and other Federal agencies such as the FDA.

(2) Private or Public Professional Groups

During the past two years the NLM has developed cooperative arrangements using MEDLARS to prepare master film copies of specialized recurring bibliographies which have been printed and distributed by the cooperating private professional groups. These recurring bibliographies include the semimonthly Index of Rheumatology published by the American Rheumatism Association, the Index to Dental Literature published by the American Dental Association, and the Bibliography of Medical Education published by the Association of American Medical Colleges. The NLM has agreed to furnish the Pharmaceutical Manufacturers Association with duplicate MEDLARS tapes for use in PMA's proposed search service for its member companies.

These examples are representative of the many types of organizations and institutions which will provide specialized bibliographic services to their memberships derived from NLM's centrally prepared data tapes.

Mission-oriented information centers directly serviced by the NLM will also constitute an important link in the overall network. They will be

dependent on regional and local libraries for the provision of hard copies of the literature required to supplement the search services. By agreement, they will feed back criticism and comment which will be used to strengthen the network. As producers or originators of information, they will contribute to the network's input.

Representing the user groups, they will involve the scientific community in the establishment and maintenance of quality control for the system. Implementation of mission-oriented dissemination activities is related to the programs described in Section VII.

D. Coordination of Network Development

Responsibility for the development of programs under the Medical Library Assistance Act in support of a National Medical Library Network has been assigned to the National Library of Medicine and its Board of Regents. It is particularly important to the successful planning, design, and operation of this network that those organizational elements sharing this responsibility are closely coordinated.

The responsibility is shared as follows:

The Board of Regents has a statutory responsibility to advise the Surgeon General in the preparation of general regulations, and in the development of policy. It also has the responsibility to consider and recommend all applications on construction grants.

The Library's Extramural Program has responsibilities for:

1. The establishment of mechanisms for cooperative planning with state and private agencies affected, as well as the cooperative development of standards;

2. The development of resources (facilities, publications, and manpower) for the overall network;
3. The stimulation of research and development for improvement of the functions and activities of the network.

The Library's Intramural Program is responsible for:

1. The development of resources and services to be utilized by the network;
2. Research and development related to communication technologies which will strengthen these resources and services.

The Office of the Director has responsibilities for:

1. The integration of planning and operations;
2. Funding of the Federal contribution to the network;
3. The evaluation and review of operations;
4. Public information and publications management.

Support and development of the regional and local library units is the primary objective of the Library's extramural programs. Development of centralized resources, facilities and services to the network is the primary objective of NLM's intramural programs. The development of specialized information activities in general is the responsibility of other governmental and private program interests. These mission-oriented information centers will relate to the network as the call upon network resources for part of their input and to facilitate dissemination of their products. Professional library and information organizations, such as The Medical Library Association, play an important role in the establishment and maintenance of standards, recruitment, professional education, and stimulation of independent study. The Library will assume the responsibility of stimulating the establishment of common objectives and will coordinate their activities to provide quality information services through the network.

CENTRALIZED ACTIVITIES AT THE NATIONAL LIBRARY OF MEDICINE

IV. CENTRALIZED ACTIVITIES AT THE NATIONAL LIBRARY OF MEDICINE (Fig. 7)

As the Nation's primary resource for accumulating, preserving and distributing information relevant to health, the National Library of Medicine is the custodian of nearly 1,250,000 books, journals, theses, photographs, and other graphic materials relating to the health sciences.

The NLM, while continuing to serve as a central resource, will assume additional responsibilities in the development and operation of the network.

With advice from the Board of Regents, and working with the institutions and organizations concerned, the NLM will coordinate planning of network development. The NLM will provide guidance for participating institutions as well as funds for the support of the local and regional components in a federal/private sector partnership.

The NLM will engage in a comprehensive, international acquisitions program to procure published medical literature and other learning resources. This will necessitate a constant search for all informational materials in the medical field. This will require revision of policy on scope and coverage to encompass new interdisciplinary fields, e.g., molecular biology and space medicine.

All materials entering the network through the NLM will be cataloged. Substantive journal articles will be indexed. To ensure standardization of format, consistency, and economy, bibliographic processing will continue to be handled centrally by the NLM, which has been indexing and cataloging the world's medical literature for almost a century.^{18/} The NLM's indexing

CENTRALIZED ACTIVITIES AT NLM

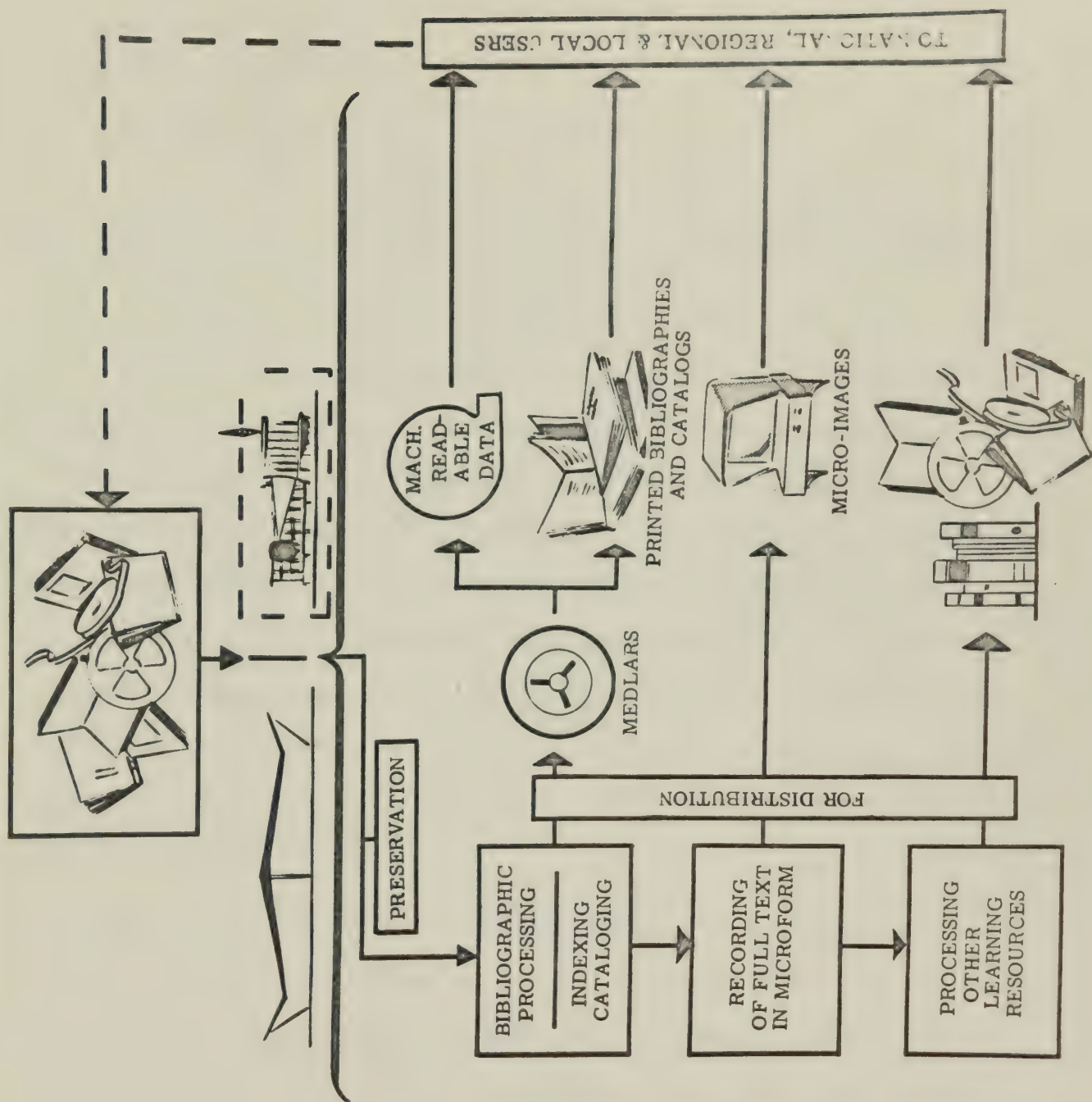


Fig. 7

program should be accelerated to include every new journal article of significance. The indexes and catalogs will be available to all users in machine readable form as well as in hard copy.

The bibliographic data generated will be entered into the NLM computer store. This data will then be retrieved on demand and transmitted to all regional and local libraries and primary user groups.

In the past it has not been economically feasible for most libraries to acquire complete issues of all journal titles. Some of this important material is still available in original form; some can be obtained only in microfilm form. To ensure the availability of this information, the National Library will initiate a program of microfilming and the purchase of microfilms for commercial sources. Information in microform will thus be available for strengthening the resources of regional and local medical libraries, either on a duplicate film purchase plan or on an interlibrary loan basis. A graphic image storage and retrieval system will be linked to the computer system as a major transfer mechanism.

In an effort to provide regional and local libraries with abstracts of significant articles, in addition to regular bibliographic services, the NLM plans to develop a central computer file of abstracts. The abstracts will be produced through extramural programs contracts with outside groups and through other cooperating PHS programs. Techniques are being developed which will enable abstracts to be stored in microform in a mechanized file for retrieval automatically as an adjunct to MEDLARS bibliographic services.

Through a Center for Biomedical Communications the NLM will procure and develop other learning resources for dissemination throughout the network. These resources will include motion pictures, video tapes, and other audio-visual materials, as well as unpublished reports.^{22/} This center will be located in a new branch of the NLM (which will serve as a regional medical library) situated at a university-based complex, serving as the major research and development arm of the NLM.

As the use of automated printing increases, magnetic tapes or paper tapes carrying complete texts of documents will be acquired by the NLM for experimental use in automatic indexing. To keep current with new publishing technology and to assist in developing new publishing procedures which may lead to improved bibliographic processing, the NLM will maintain a continual liaison with publishers.

As it now does, the NLM will provide service to components of the network guaranteeing access to any information source required by them,^{19/} and will continue to provide local or direct services to other Federal agencies, professional societies, and will serve as the regional library for the Middle Atlantic States.

Technological developments in information handling, during the past decade, have enabled the Library to assume national leadership in automated

bibliographic searches, computerized cataloging, and rapid photocopy
20/
services.

The current NLM computer (Honeywell-800) was installed in March 1963. In January 1964, the NLM began operation of MEDLARS, a new computer-based
21/
Medical Literature Analysis and Retrieval System. By the end of 1965, computer utilization had increased to 650 hours per month -- approaching the machine's capacity.

With expanding demand for the computer products, and with rapidly increasing information to be analyzed, organized and distributed, the Library instituted MEDLARS decentralization programs and initiated a feasibility study for developing specifications for a new computer system. Decentralization of the system is continuing and expanding. Specifications for the new computer will be completed early in FY 1967 and submitted for competitive bidding. The major requirements for the computer include: Processing capacity at least 10 times that of present hardware; mass random access memory measured in the billions of characters; on-line consoles for direct access to the computer files; data communications capability for electronic linkage to other centers.

All the NLM information systems, discussed below, are totally dependent upon the installation of a new system in FY 1968. The new hardware

constitutes a necessary resource for the development of the biomedical library network.

The successful operation of the biomedical network is dependent upon qualitative as well as quantitative services of the NLM. The Library will expand and extend traditional services. Other learning resources such as audio-visual materials must be added to its collection so that access to them is made available in the same way as printed texts.

The NLM will continue to investigate and implement, whenever feasible, new communication modalities which will make for more efficient and accelerated dissemination of biomedical information.

A. Acquisitions and Cataloging

To fulfill the Library's responsibilities to American medicine, in view of the proliferation of biomedical publications, the Library must appreciably strengthen its collection during the next five years. Insufficient funds for the purchase of needed titles over the years has imposed deficiencies on the collection. Acquiring them now is costly and time-consuming, and many titles are out of print. These deficiencies are of two types: lacks in areas traditionally designated as "medicine"; and equally significant, lacks in area of the physical and behavioral sciences from which medicine now draws extensively. Unfortunately, even now, 3 percent of all interlibrary loan requests cannot be filled.

Immediate action will be taken to expand the NLM's program of purchasing and cataloging the increasing volumes of biomedical health-related literature.

B. Preserving the Collection

All libraries with large research collections and archival responsibilities face the loss of a large proportion of their resources because of the chemical deterioration of the paper on which publications are printed.^{23/}

New methods of paper manufacturing were introduced approximately 100 years ago and are, in fact, employed today. The wood pulp is treated with chemicals with an excessively high residual acid content which with the passage of time renders the finished paper brittle. Much of the paper becomes extremely fragile -- so fragile that many publications must be withdrawn from circulation to avoid irreparable damage. Considerable information in the NLM collection has already been lost. About five million pages are critically deteriorated, and an additional 32 million pages are in such poor condition that even one-time use will probably result in losses.

In Fiscal Year 1966 the Congress appropriated \$220,000, in addition to the amount requested in the President's Budget, to serve as a base for a microfilm preservation program. In November 1965, a Graphic Image Storage and Retrieval Conference was held in Bethesda to consider the results of a collaborative study by the NLM and the National Bureau of Standards on the Library's photoduplication system requirements.^{24/} On the basis of information and specifications in the study report and the recommendations

of the conference, the NLM intends to step up its paper preservation program. Deteriorated materials will be preserved on 35 millimeter reel film. This material can be converted to another form for incorporation into a new graphic image storage and retrieval system. A pilot contract has been let for the filming of approximately one million pages. Production for preservation purposes in the NLM's own photoduplication plant has increased to between one and a half million and two million pages per year. It is anticipated that, in Fiscal Year 1967, four million pages will be micro-filmed: two million in the Library and two million on contract. With this experience and that gained from continued technical study, the Library will be prepared to expand under stringent quality controls the rate of production in Fiscal Year 1968 to thirteen million pages: three million pages to be filmed in the NLM; ten million pages to be filmed on contract. This Fiscal Year 1968 level of production will be sustained over the five-year period.

C. Reference and Interlibrary Loan Services

Although the NLM five-year program design focuses on new modalities of library services, the NLM will carry a continuing responsibility for providing an increasing volume of traditional library services, such as reference and interlibrary loan. Regional medical libraries will service a large share of the increasing^{5/} national demand for such services from comprehensive biomedical library centers. However, the NLM's own capacity must be augmented, so that it may continue to adequately utilize its present facilities, planned for this purpose, to service the Nation's biomedical libraries and continue to provide direct services to other Federal agencies, to institutions in the Washington metropolitan area and throughout the mid-Atlantic states.

In Fiscal Year 1965, the Library recorded an increase of fifty-six percent over the total reference services provided in Fiscal Year 1963. Mail inquiries rose thirty percent beyond the Fiscal Year 1964 total. It is estimated that by Fiscal Year 1967, interlibrary loan requests will number thirty percent more than the number received in Fiscal Year 1964. Statistical projections indicate that all library services provided directly by the NLM will continue to increase through Fiscal Year 1968.

D. Information Systems

1. MEDLARS (Fig. 8)

The computer-based MEDLARS (Medical Literature Analysis and Retrieval System) produces three products: (1) the monthly Index Medicus and the annual Cumulated Index Medicus which cite articles appearing in current biomedical journals; (2) recurring bibliographies such as Index of Rheumatology and Index to the Dental Literature; and, (3) customized bibliographies on demand for individual scientists, educators, and practitioners.

The number of articles entered into the computer files since MEDLARS became operational (January 1964) now exceeds 400,000. Index Medicus production grew from 145,000 articles in 1964 to 171,000 in 1965. Five recurring bibliographies were produced regularly during 1964 and approximately 3,000 demand searches were processed and sent to requesters.

Despite the impressive performance of MEDLARS during its first two years of operation, continued improvements in quantity and quality of the system must be effected.

MEDLARS

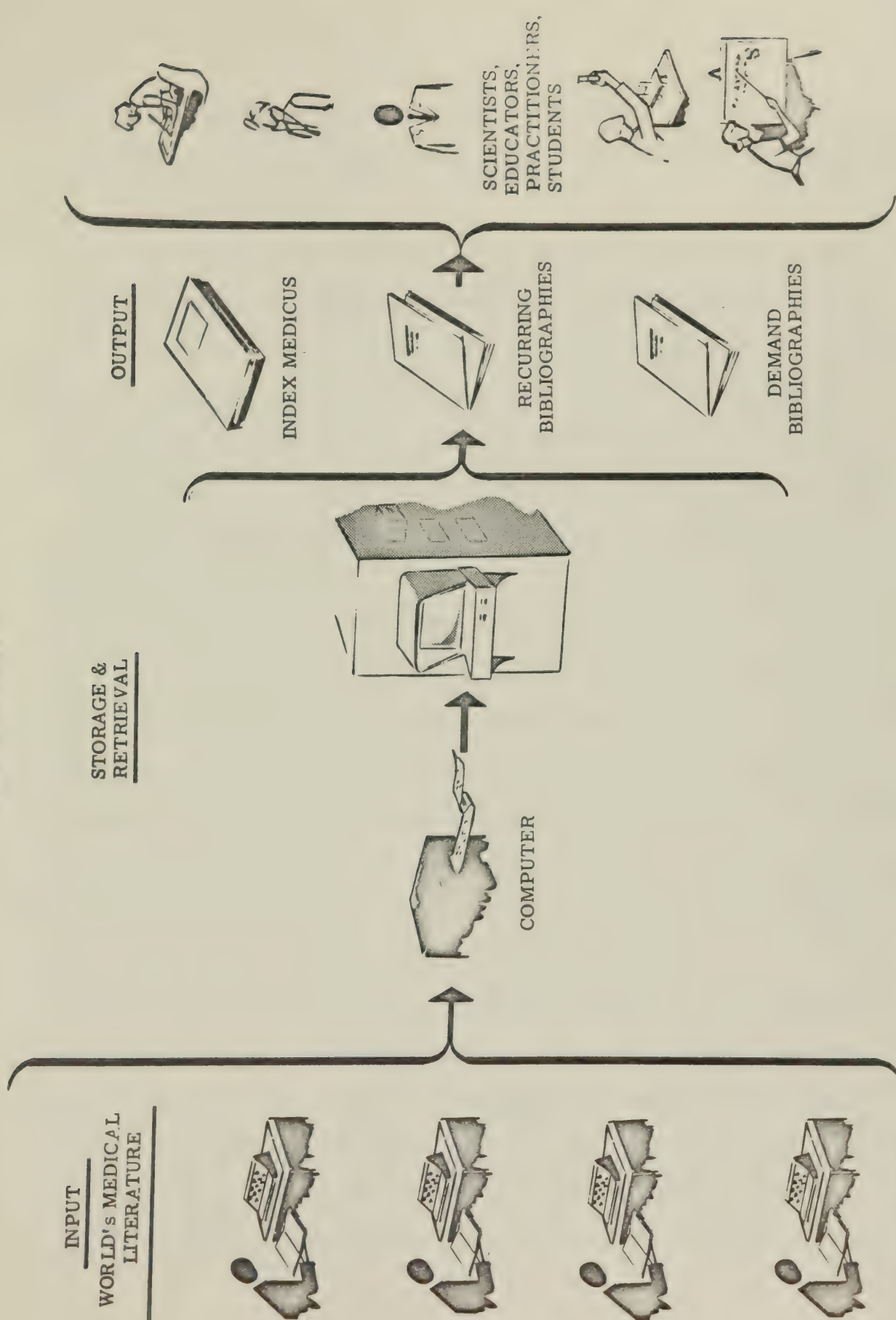


Fig. 8

The service objectives of MEDLARS over the next five years are:

1. To increase the number of substantive journal articles indexed to 300,000 per year;
2. To produce fifty recurring bibliographies regularly each year;
3. To expand the number of demand searches produced at the central NLM facility to 5,000 per year, and 39,000 at the regional level;
4. To continue to expand and improve the list of Medical Subject Headings which is the keystone of MEDLARS;
5. To complete a formal test and evaluation of MEDLARS and initiate a substantive program of quality control in all parts of the system.
6. To provide wider distribution of literature searches.

The main deterrents to increased productivity from MEDLARS have been inadequacies in personnel and funds. To meet the objectives set forth for this program, the MEDLARS operation will require additional funds and positions for literature analysis, search formulation, vocabulary development and control, computer programming and operations, and systems evaluation. The Bibliographic Services Division, which is responsible for indexing, search formulation, and preparation of recurring bibliographies, will require strengthening in positions and fiscal resources. Increasing amounts of indexing will be done under contract. The medical subject headings staff, responsible for vocabulary development and control, will require additional positions and financial support. The Information Systems Division will require modest increases in staff for MEDLARS computer operations and programming during the five-year period in order to maintain

service levels while the new computer system is under development.

2. Decentralization

In order to increase the power and productivity of MEDLARS, and to provide for demonstration and testing under field conditions, a program to decentralize the search and retrieval capability of the system was initiated in FY 1965. Contracts were awarded to the University of California at Los Angeles and the University of Colorado to operate MEDLARS retrieval centers using duplicate MEDLARS tapes on local computer equipment to provide bibliographic search services to users in their geographic area.^{25/}

The UCLA contract also included converting the MEDLARS search and retrieval computer programs for use on equipment not directly compatible with the NLM's computer.

During FY 1966, geographic distribution of MEDLARS demand searching is being expanded to a total of five centers. Continuation of support for MEDLARS search centers is not contemplated beyond five years. Instead, where such centers coincide with regional libraries, support for their continuing function is intended to be assumed under regional library grants.

Another phase of the MEDLARS decentralization program will be the sale of magnetic tapes to qualified users on a subscription basis, so that any biomedical institution can use the system locally if so desired. This phase will be implemented as soon as programming supported in the first phase becomes available.

1. Establish seven operating MEDLARS search centers, each to provide 3,000 demand searches per year;

2. Continue to negotiate agreements with special interest groups to provide search services to their members;
3. Support the development of specialized information centers by making MEDLARS tapes on products available to them;
4. Initiate a project for selling MEDLARS tapes (at cost of tape conversion and copying) to institutional users.
5. Test and demonstrate the effectiveness of decentralization.

Five of the seven MEDLARS search centers will be fully operational in FY 1967 with the sixth and seventh centers commencing operations in FY 1968. Pilot operations of the magnetic tape subscription service will go into effect FY 1966. Full operation will be implemented at the beginning of FY 1968. Agreements with mission-oriented groups and specialized information centers will be negotiated throughout the five year period.

3. Drug Literature Program

A Department-wide project was started in FY 1966 to develop a comprehensive drug information system in three areas: unpublished information, published information, and research and experimental studies. The National Library of Medicine was assigned the responsibility for a comprehensive program dealing with the published literature on drugs.^{26/}

The Five-Year Drug Literature Program Objective are:

- Development of a computer-based chemical file (auxiliary to MEDLARS) of detailed information on 40,000 chemical compounds;
- Specialized depth-indexing of the published literature dealing with these drugs and compounds;

- Complete synonym control of the drug literature to bring together all material related to the same compound;
- Automatic search of the chemical file for specific compounds, substructures, and mixtures, to relate these chemicals to their biological activities;
- Development of specialized bibliographies and abstract services related to the properties of drugs and chemicals;
- Coordination of the drug literature program with other Federal agencies (including NIH, FDA, and NSF) and organizations interested in different aspects of the problem;
- Completion of systems studies to determine the feasibility of storing non-bibliographic information with each reference (numerical and other standardized data and structural formulae);
- Completion of studies of distribution patterns and optimum packaging of drug information to reach the practicing physician at the local level through the hospital pharmacist^{27/} or other information specialist at local medical centers.

The auxiliary chemical file will be operational in FY 1967. Specialized bibliographies will be provided throughout the five-year period. Substructure searching will commence in FY 1969.

4. Technical Services Automation

In January 1966, the Library instituted rapid centralized cataloging for medical libraries throughout the United States. Review copies of new medical books received from cooperating publishers and other sources are

are cataloged immediately upon receipt. The cataloger's data sheet is punched into paper tape and entered into the computer for processing. Every two weeks the computer system produces the NLM Current Catalog, a printed listing of new books which is sent to other medical libraries as a current acquisitions and cataloging tool. The computer also produces a cumulative quarterly catalog as well as 3 x 5 cards for the central NLM catalog.

The automation of catalog processing is only one part of an integrated data-processing system designed by the Library for mechanization of all phases of book selection, ordering, cataloging, and shelving of new acquisitions. The final phase of this project will be eventual replacement of the central NLM card catalog by either frequently updated book catalogs or a direct-access computer file which can be queried through on-line console units.

The Library plans to develop its Technical Services Automation Program through:

- Completion of the design and implementation of the total system for automation of the selection, ordering, and processing of all new books;
- Conversion of the serial record (currently on Kardex file cards) to machine-readable form;
- Conversion of the NLM catalog for the years 1950 - 1965 machine-readable form;
- Completion of a feasibility study to determine whether the card catalog (1950 and later) should be converted to (a) a book catalog

or (b) a direct-access computer file;

- Exploration with the Library of Congress and National Agricultural Library the possibility of establishing a Nationalized Centralized cataloging service.

Detailed design and programming of the total system can begin in FY 1967 with completion targeted for FY 1969. The feasibility study on possible replacement of the card catalog can begin in FY 1969 and conversion of the catalog from 1950 on will be accomplished in FY 1969 and FY 1970.

5. Graphic Image Storage and Retrieval

In order to supplement the capabilities of MEDLARS in disseminating bibliographic citations to scientific information, the Library is developing new technique for retrieval and disseminating of copies of regional documents to individual users. It is also concerned with document resource development of other medical libraries. Microfilm technology and dissemination microforms have been developed to the point that a Graphic Image Storage and Retrieval System for high-usage materials now appears feasible.

The Library has begun a survey of the technical alternatives and has consulted a number of technical experts in the microfilm and systems fields.^{24/} A number of areas have been identified for data collection and systems studies. It is also evident that the Library should maintain continuing coordination with other agencies engaged in or planning graphic dissemination systems so that existing experience is utilized and appropriate quality standards are developed. Several experimental pilot projects will be required for the testing of the technical alternatives in the context

of the Library's collection and other services, as well as in relation to the information requirements of other institutions and the ultimate individual users of graphic products.

The Library plans to develop a Graphic Image Storage and Retrieval System through:

- Conducting a statistical study of the nature of the Library's collection with particular emphasis on the characteristics of current incoming materials;
- Conducting a study to identify and characterize various user groups to be served and their specific information requirements with emphasis on graphic products;
- Conducting appropriate systems studies and experimental pilot projects to determine the best microimage format(s), production hardware, and system(s), for an NLM Graphic Image Storage and Retrieval System. These studies and projects will include other potential NLM graphic applications such as files of catalog cards, abstracts, etc;
- Establishing and operating a Graphic Image Storage and Retrieval System as part of the National Biomedical Library Network.

Systems studies and pilot projects will be conducted in FY 1967, FY 1968, and FY 1969. Some potential NLM graphic applications may become operational during these years. The Graphic Image Storage and Retrieval System for document dissemination will be installed in FY 1970.

6. Abstract Handling

The MEDLARS System presently provides only bibliographic data in response to a computer search. ^{21/} Many investigators express a need of abstracts

as well.

A pilot study will determine the feasibility of providing copies abstracts generated by government programs as additional output of a MEDLARS search. Many problems will have to be solved ranging from relationship with private organizations specializing in scientific abstracting to the question of how to store and retrieve the abstracts, e.g., should they be keypunched into machine-readable form and entered into the computer, or should they be stored in some rapidly accessible secondary form such as microfilm?

A detailed analysis of the problem will be carried out followed by the design of a new abstract handling system. A pilot model of the new system will be implemented to demonstrate the feasibility of the system design.

The NLM plans, in the development of an Abstract Handling System Program To:

- Study the feasibility of modifying MEDLARS so that demand searches may produce abstracts as well as a bibliography;
- Develop relationships with other PHS program for efficient storage, retrieval and dissemination of abstracts.

Systems analysis and design along with planning of new extramural support regulations should begin in FY 1968 and continue through FY 1970. The pilot system will be in operation late in FY 1970.

E. History of Medicine

The Library's resources for historical scholarship in the medical and related sciences are among the richest of any institution in the world.

Collected over many years, they include, in addition to rarities, exhaustive

materials in depth for the support of studies in the history of human health and disease.

In keeping with its active support role, NLM will pursue a program to stimulate and provide assistance for historical scholarship. The NLM five-year plan includes: further development of the Library's historical resources; strengthening bibliographic access to historical materials; promoting historical scholarship both within the NLM and in other institutions.

The specific history of medicine program that the NLM plans to activate includes:

1. Acquisition of Additional Resources

The NLM will enlarge its acquisition program in the following areas:

- a) Modern manuscripts. Such manuscript records as correspondence, unpublished reports, memoranda, etc., are necessary for the historian to achieve the fullest possible understanding of the development of medical sciences and institutions.
- b) Oral history. To capture some of the views and data locked in the minds of key participants in the development of medicine in our day, the NLM has started and plans to develop substantially a program of taped interviews which will be transcribed, edited, and preserved for historical purposes.
- c) Published sources. The NLM will accelerate its activity in the acquisition of out-of-print materials of historical importance.

d) Reference works. As an active center of research in the history of medicine, the NLM plans a major expansion of its collection of reference works, critical texts, and other materials related to the history of medicine which the scholar should have at hand in the conduct of his research.

2. Bibliographic information service

The Library is pursuing an action program of cataloging. A catalog of 16th century imprints is currently in production. Catalogs of the 17th and 18th century collections and of the manuscript collection are being developed. In addition the Library is preparing to issue in FY 1966 the first of a series of annual bibliographies of current publications relating to the history of medicine. New projects which the Library should institute include:

- a) Special retrospective subject files to existing literature on the history of medicine and related materials;
- b) Special guides to resources, in libraries and elsewhere throughout the nation, for research in the history of medicine, particularly manuscript collections.

3. Research and Teaching

The Library will continue building a staff capable of carrying out independent bibliographic and historical research of a high caliber, to prepare works of original scholarship in the field of medical history and bibliography. The NLM believes that such a program is essential if the Library is to attract

to its staff persons qualified to carry out its other programs for additional resources and information service, to give appropriate assistance and consultation to visiting scholars on a basis of professional equality, and to carry on informal post-graduate training for research fellows and other students working in the Library. The Library also intends to carry out a planned program of seminars, lectures, and symposia by outside speakers, staff members, and visiting scholars.

The Five-Year History of Medicine Program Objectives are:

- To serve as an active center for research, training, and publication of original works in scholarship in the history of medicine;
- To serve as a center of bibliographic information relating to existing primary sources and secondary literature in the history of medicine;
- To serve as the primary central resource collection for the Nation of original source materials in the history of medicine;
- To serve as a source of support for the development of medical history as an academic discipline in medical schools and universities throughout the Nation.

An immediate start on developing an oral history program will be made next fiscal year. The publication of definitive historical catalogs will be accelerated, as will the production of original scholarly contributions to the field of medical history.

F. Intramural Training

In order to fulfill its responsibility as a national resource, the NLM must strive to provide a staff competent to provide service at a level

of excellence and to further improve and perfect innovations in biomedical communications. The NLM's leadership responsibilities call for a program to broaden the skills of a new generation of medical librarians who must be provided with the ability and faculty to develop and apply new technologies.

The NLM five-year plan for an intramural training program considers these two broad areas of responsibility as inter-related and inter-dependent activities. The first stages of the training program have already been instituted. Full implementation is scheduled for early Fiscal Year 1967. Component programs of the overall NLM intramural training effort are:

1. Technical training for MEDLARS development. Technicians are being trained in three areas relating to MEDLARS: (a) indexing, (b) search formulation, and (c) systems analysis. Training of professionals to develop a team of skilled specialists in the health sciences is essential to the further decentralization of MEDLARS (V, D. 2).

2. Career development for NLM personnel. The NLM supervisory staff is encouraged to identify promising candidates for management training. A program of rotating work assignments, seminars, and discussion groups is designed to sharpen skills, provide an overview of Library programs, and develop leadership potential.

3. Library Associate Program. The Library is recruiting outstanding young graduates from library and information science schools for advanced training. After an academic year of intensive specialized work, associates either seek affiliation with other medical libraries, or apply to the NLM for a career conditional appointment.

G. Requirement for Additional Space

The facilities of the NLM in Bethesda were planned and developed for the classic research library functions. Even though the Bethesda physical plant is modern, its planning ten year ago anticipated an optimum staff of 250 with sufficient stack space to allow for growth of the collection for 25 years. The projection has proved to be unrealistic. Adoption of the newest technological improvements in library operations meant added equipment and augmented staff, which now numbers 300. The ever expanding biomedical literature stimulated an increased and accelerated collection activity with a resultant depletion of stack space.

Development of the unique MEDLARS program, for which no space had been planned in the new building, has resulted in the establishment of the world's largest, library-based, computerized system for the storage and retrieval of scientific information. This system's capacity for handling a multiplicity of specialized information requirements in specific areas of medical research is attracting groups who wish to work in close proximity to the facility. No space is available to accommodate them. In addition, the system designed in 1962 is no longer sufficiently rapid or flexible to serve current user requirements.

Since the NLM building was constructed, the Library has assumed major new program responsibilities, for both its growing intramural programs and for new extramural programs, to support and improve communication in the health sciences. Further growth is imminent. Three hundred and seventy-four positions are included in the President's Budget for FY 1967.

Accommodating the projected growth in staff will mean even further depletion of stack space to the extent that, by FY 1970, all reserve stack space will be exhausted.

This unexpected, yet essential, surge of program activity has had such a tremendous impact on the existing facility that funds are urgently needed to design and construct an annex adjacent to the National Library of Medicine building. The annex will provide facilities to accommodate the growth of the Library's staff, the inauguration of new programs, and redefined and expanded existing programs. The annex will contain the Library's computer and data processing operations and will provide space for intramural research in information handling and processing. The annex will also house the Extramural Programs staff, which is scheduled to occupy rented facilities beginning in FY 1967. Finally, the new facility will provide critically needed cafeteria and parking space.

H. Management

1. Program Analysis

The Library faces increasingly important responsibilities for the conceptualization of new programs in the area of biomedical communications, for the critical analysis of existing programs, and for the provision of standards for the direction of both current and projected programs. As the principal focus for such activities within the Public Health Service, it is imperative that the Library obtain at least a small full-time program planning and analysis staff. Currently this function is being performed ineffectively by NLM staff members who carry the burdens of responsibility for operating programs.

The Five-Year Program Analysis Objective is:

To establish a small program analysis staff to provide the full-time effort required for program planning and analysis. The program analysts

will design and maintain a system for gathering statistics and other information pertaining to biomedical libraries, health communications, and other subjects relevant to NLM program planning. They will be particularly concerned with assimilating data about the resources -- facilities, manpower, and equipment -- available to aid communication of health information through the national biomedical library network. They will identify general gaps and inadequacies in the national effort. They will assist the Director in developing and coordinating NLM program plans and objectives and will analyze operating data on NLM programs to assess performance in relationship to the plans and objective.

This activity will be partly staffed in FY 1968 and fully staffed in FY 1969.

2. Public Information and Publications Program

The principal function of the National Library of Medicine is to facilitate the communication of current health science information to reseachers, teachers, and practitioners who can employ the information effectively to restore and improve human health. To ensure that information about the NLM's program is disseminated effectively and promptly, it is necessary to have a public information and publications program staff. The Library now has a very small staff in this area which must be expanded and strengthened in order to meet NLM responsibilities to the public and professional community.

The Five-Year Public Information and Publications Program Objectives are:

- To maintain adequate control and coordination of the planning, production, and distribution of the NLM's publications;
- To provide information about the NLM's programs and services to the health community and to help satisfy public interest in NLM's health-related activities;
- To respond promptly to requests for information about the Library;
- To provide quality graphic arts materials, particularly exhibits, to assist in the dissemination of information about the Library's resources and their availability to qualified users.

3. Management Services

Administrative management services for the Library are provided centrally. Because of its unusual organizational posture, the Library is required to provide a broader range of such services in greater depth than most organizations of its size. With greatly increased program responsibilities and the enlargement of the staff and budget of the Library, resulting principally from the enactment of the Medical Library Assistance Act of 1965, prudence dictates that the administrative management offices be bolstered.

The Five-Year Management Services Program Objectives are:

- To provide additional staff to discharge the increased financial and other administrative management responsibilities placed upon the Library as a result of program growth.
- To establish a contract office to handle on-site the administration of the Library's contracting program.

Additional staff members will be required during the five-year period to handle the increased workload. These tasks will range from handling a greatly increased volume of mail to negotiating and administering highly complex contracts.

CENTER FOR BIOMEDICAL COMMUNICATIONS

V. CENTER FOR BIOMEDICAL COMMUNICATIONS

28/

A recent report~~—~~ prepared by the Committee on Scientific and Technical Information (President's Federal Council on Science & Technology) emphasizes the need for research and development capability in governmental scientific and technical information programs. The report specifically states: "Capability to conduct research on information systems will be required, and staff units possessing this capability should be a part of every major unit in the national network of systems."

The Federal biomedical communications effort has been characterized by dispersal of theoretical investigation and a lack of active development programs associated with operating information retrieval systems. New ideas for possible incorporation into operating systems have had to be either rejected for lack of data on the effectiveness of the proposal, or incorporated into the system without first being adequately tested and validated.

The PHS, with its many operational information activities requires a concentrated internal research and development activity for study of communication problems. It is logical for the NLM, which is directly servicing the PHS as well as other mission-oriented information centers, and which constitutes a central PHS information resource, to establish a centralized program geared to PHS interests in this area. Such a program will have the added advantage of attracting and retaining qualified personnel.

The NLM will establish a Center for Biomedical Communications (CBC, Fig. 9) with the capability of: research in information science; technological development; investigation and program services in the area of continuing education.

The Center will be located in a new facility, a branch of the NLM which will function as a regional medical library. The CBC will function as a resource and guidance activity for PHS and other Federal agencies, other regional medical libraries, and other public and private institutions and organizations.

The NLM plans to mount the initial stages of planning and development so that the Center can become fully operational in FY 1972.

A. Research and Development

Several programs will be created to carry out an active research and development mission. These are listed below, along with a few examples of a typical Center for Biomedical Communications projects.

1. Applied Mathematics and Statistics Program - research in the mathematics of information theory; statistical sampling and analysis of relevance responses from users of information systems; artificial intelligence and self-organizing systems.
2. Scientific Documentation Program - studies of automatic indexing and abstracting; search strategy and retrieval techniques; thesaurus development techniques.

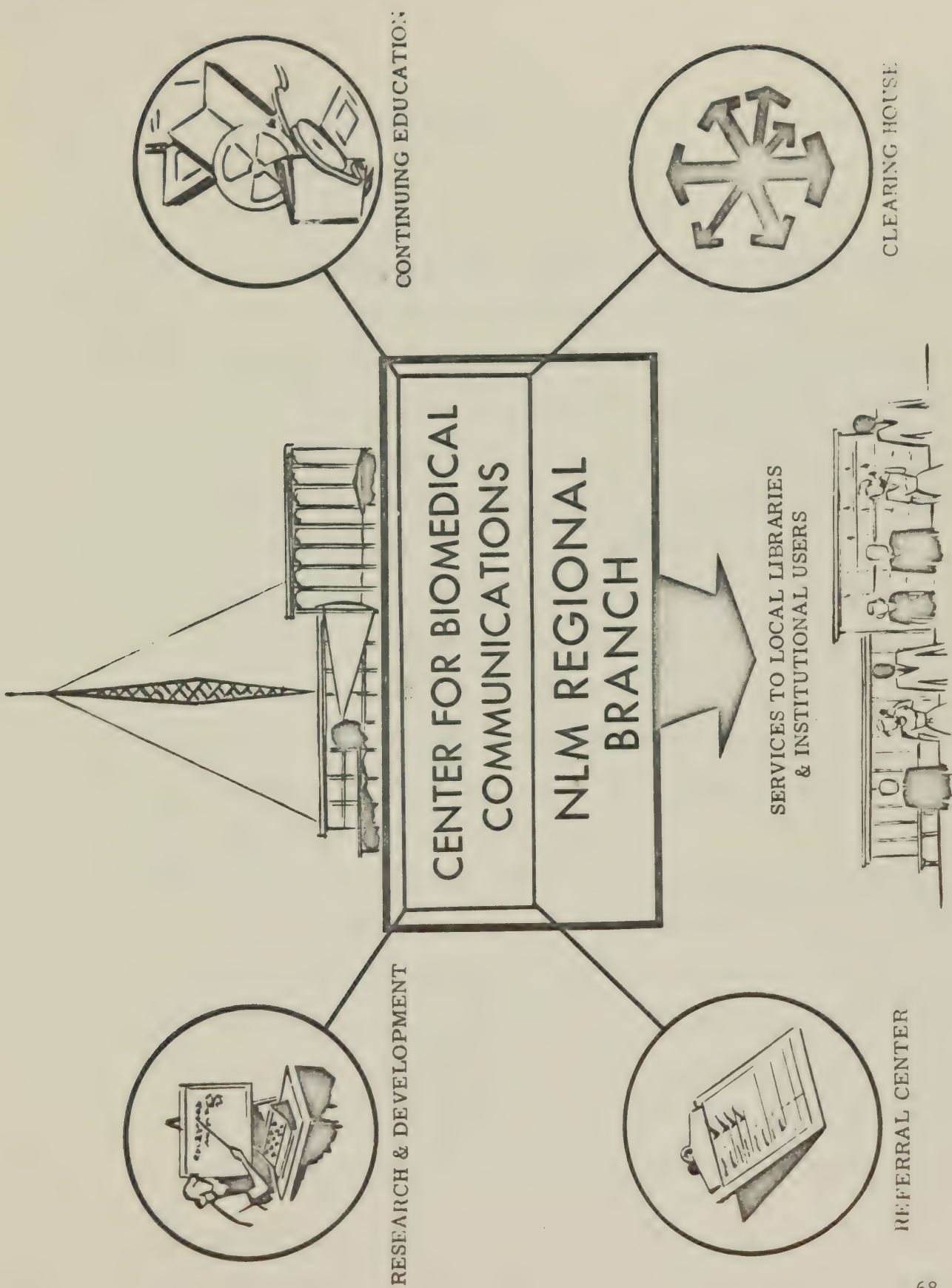


Fig. 9

3. Applied Linguistics Program - studies of computer manipulation of natural language; semantic and syntactic methods for analysis of material from full text or abstracts.
4. Human Engineering Program - investigations of user populations; studies of information habits of scientists; studies of relationships between scientists and the institutions from which they receive information services; studies of optimum methods of packaging information.
5. Engineering Program - testing of new equipment for such things as electronic data transmission, facsimile transmission of document images, graphic retrieval and other optical devices, mass storage systems for computers, direct-access consoles for real time computer systems.
6. Computer Software Program - development of specialized computer languages for information retrieval; construction of generalized subroutines for mass storage systems.
7. Systems Simulation and Evaluation - this program will provide the bridge between research and implementation of a new system. All proposed new information systems or subsystems would be tested and evaluated before major resources would be allocated to implement the new project. The functions performed by the Systems Simulation and Evaluation staff to be similar to those of an industrial firm's product testing and development group.

In addition to housing its own research staff, the Center for Biomedical Communications will be a focal experimental facility for the Public Health

Service. Information scientists from all programs of PHS will be invited and encouraged to use the Center's facilities as a research and testing laboratory. The Center will also serve as a major facility for visiting information scientists to test their ideas. Scientists from industry and the academic community will be encouraged to work at the Center and exchange ideas with resident members of the technical staff.

The Center will also be the site of an advanced training program in biomedical information science. A schedule of short courses and technical seminars would be developed. The training program will have all of the Center's laboratory facilities available for demonstration and practical work and could draw its faculty from the technical staff (both resident and visiting scientist).

In addition to working on specific problems related to NLM programs, the staff of the Biomedical Communications Center will be conducting research of general interest to all engaged in similar work. The professional staff would be encouraged to publish their results, and the Center will produce a series of technical reports for wide distribution.

B. Extramural Research and Development

1. Research and Development Grants and Contracts

To help compensate for the years of neglect of research and development in medical library science, the NLM will institute an active extramural research and development program (VII).

C. Continuing Education

There is general agreement that the problem of insuring prompt application of new research findings to the practices of the health professions can be solved through programs for continuing education.^{29/} Progress to date has been slow for two reasons: inadequate attention to professional incentives, and lack of technical resources.

Programs under development on many fronts can be looked to for the provision of increased incentives. Following valuable pioneer work by such organizations as the Association of American Medical Colleges,^{29/} the American Medical Association is developing a National Plan for Continuing Medical Education.^{30/} Many professional societies, including organizations like the American Nurses Association, are developing national programs in their fields. Within the Public Health Service a new major program, the Regional Medical Center Program, has just been launched, adding materially to existing programs in the Division of Community Health Services^{31/} and the Communicable Disease Center.

It is reasonable to assume that the next five years will witness massive efforts to provide for forms of continuing education in all the health professions. Concentration of national health planning on improved medical care to individuals will have far reaching results.

In developing resources to support the developing national programs for continuing education, insufficient attention has been devoted to local dental and medical society and hospital libraries as information transfer

points. Considered as learning resources (not in traditional library terms) they constitute existing -- although grossly underdeveloped -- facilities in which to center educational and retaining programs at the grassroots level.^{32/} To enable these institutions to function as effective resource centers for continuing education information, they will require the introduction of other learning resources and information transfer devices and augmented collections of books and journals. They will need to be incorporated into local or regional professional education programs, in turn affiliated with national programs. An experiment, test, and demonstration program is needed to precede wider adoption of a library-centered continuing education program.

To accomplish these objectives:

1. The Center for Biomedical Communications will conduct intramural research and development and demonstrations in the field of continuing education. New bibliographic and other library tools will be field tested, and demonstrated in practical working situations, using local libraries as a field resource. Examples of such tools are:
 - a. Experimental "total texts" which combine audiovisual media with printed text;
 - b. Development and field-testing of computer-aided instruction devices in combination with other learning resources;
 - c. An abridged Index Medicus, keyed to the journal resources of the small hospital library.

2. The Center will serve the Library's grant programs as a resource for programming (V) in support of continuing education, with three specific objectives:
 - a. To improve the effectiveness of community hospital libraries in continuing education of health personnel, by providing grants, e.g. to add educational films, tapes and equipment; or to study the optimal size and the reference services appropriate for a 200-bed hospital library.
 - b. To develop in professionals the capacity for independent learning; for example: encouraging professional schools to experiment with teaching the use of informational resources; or studies of the scope and use of personal libraries of practitioners and how they can be made more effective.
 - c. Training grants to improve the training of biomedical information personnel for educational roles.
3. The Center for Biomedical Communications will serve as a specialized resource and information referral center for biomedical education materials, including bibliographies, indexes, and traditional published materials. It will also function as a repository and distribution center for new learning resources such as films, film strips, audiotapes, videotapes, and curriculum materials in programmed instruction form for continuing education.

Chief continuing education resource development activities planned for implementation at the Center are:

- a. The development of cooperative relationships throughout the Public Health Service to provide for both improved access to non-printed learning resources and supplementary distribution of PHS program material to local users through the biomedical library network;
- b. The development of cooperative agreements with agencies preparing and/or distributing audiovisual materials, core curricula, programs of instruction, etc., to provide for supplementary distribution of these materials through the medical library network;
- c. The development of a representative collection of new learning resource media to be serviced by interlibrary loan;
- d. The development of announcements to advertise the availability of these materials to libraries and information centers.

The Five-Year Research and Development Program Objectives for the Center for Biomedical Communications are:

1. Complete the planning of the functions and mission of the Biomedical Communications Center;
2. Develop minimum requirements for the physical plant;
3. Develop operational program plans and relate programs with ongoing research and development activities to develop a nucleus staff;
4. Select a site for the building; acquire necessary property;

5. Prepare architectural drawings;
6. Contract for construction of the building;
7. Complete staffing and equipping of the facility;
8. Begin operation of the center (FY 1971).

Planning of the building and related facilities would be carried out in FY 1968. Architectural design and construction would span from FY 1969-1971 with dedication and occupancy in FY 1971.

NATIONAL HEALTH INFORMATION CLEARINGHOUSE AND REFERRAL PROGRAM

VI. NATIONAL HEALTH INFORMATION CLEARINGHOUSE AND REFERRAL PROGRAM

Utilization of audio-visual materials and other non-printed educational media is common among public and university library systems. Medical libraries have also moved to acquire and service audiovisual media supplementary to their book resources.

Concentrating on meeting its historic responsibilities for acquiring, processing, and disseminating the published literature of the biomedical sciences, the National Library of Medicine has not been able to take the initiative in establishing related functions for information resources other than printed books and journals. As a modern national biomedical communications resource, responding to all needs of its users, the Library must provide accommodation for other forms of medical information and learning resources. NLM will, therefore, develop its own resources of such materials and establish a clearinghouse to enhance this availability through the medical library network, which offers a dissemination mechanism for the utilization of these resources at the local level.

Closely related to this activity is a national need for referral^{7/} services. As specialized information activities are rapidly developing throughout the biomedical community, it becomes increasingly difficult for the user to locate those information centers and data which will satisfy his unique needs. At present there is no single point of entry into the multiplicity of specialized information services and systems of PHS programs, or to systems operated by other public or private interests.

As the nation's central biomedical communications resource, the NLM will establish such a referral service.

Both the clearinghouse and referral service programs represent functions which may well be conducted within the proposed Center for Biomedical Communications. They are herein described without prejudice to their geographic location.

A. Health Information Clearinghouse

The sub-programs of the NLM Health Information Clearinghouse are designed to provide centralized distribution services of non-printed forms of information through the biomedical information network. Central clearinghouse functions will include acquisitions and cataloging, publication of announcements, and dissemination by loan or microcopy to the network.

1. New Learning Resources Dissemination

In cooperation with the PHS Audiovisual Facility at the Communicable Disease Center, and other public and private programs, the NLM plans to acquire selected films, film-strips, audio tapes, and recordings, and related materials to service the network. NLM will encourage the utilization of these learning tools through programs of continuing education at modern library and information centers. This program closely relates to the NLM Center for Biomedical Communication (V).

During the five years of program development, NLM will:

- a. develop cooperative agreements with agencies distributing audio-visual materials, providing for an NLM supplementary distribution function to the medical library and information network;
- b. produce announcements to advertise the availability of these materials to librarians and information centers;
- c. develop a representative collection of new learning resource media to be serviced by interlibrary loan;
- d. provide inhouse technical competence to operate the program.

2. Auxiliary Publications

Many valuable data are excluded from journal publications, because of editorial page space restrictions, and are, therefore, unavailable to other scientists. Thirty years ago the American Documentation Institute,^{33/} in cooperation with the Library of Congress, formulated a plan whereby microfilm copies of deposited data supplementing original publications could be made available on request. The NLM will assume responsibility for servicing biomedical data which supplement published papers. The Library will solicit material from editors of biomedical journals, and from authors. The data will be filmed and photocopies will be provided on request.

3. Medical Translations

Approximately 7,500 biomedical articles and books are translated annually. Many of these translations are customized to satisfy the needs of individuals. The Clearinghouse for Federal Scientific and Technical Information of the U. S. Department of Commerce and the Special Libraries Association have made an effort to establish a national pool of such

translations, which are announced in Technical Translations. However, these mechanisms require supplementation to meet the special needs of the biomedical community.

The NLM will expand its program of acquiring translations of published materials. A study will be made of the feasibility of converting the Bibliography of Medical Translations into a Supplement to Index Medicus to serve as a more effective vehicle for disseminating announcements of available translations.

Photocopies of translations will be provided on request. Techniques for tagging original unit records in the MEDLARS system to indicate the availability of translations, and to facilitate their retrieval will be studied and, if feasible, implemented.

4. Bibliography Coordination

Bibliographic activity in medical libraries and in the scientific community is now uncoordinated and, in many instances, duplicative. As a principal bibliographic resource for the biomedical sciences, NLM has a responsibility to develop and coordinate bibliographic resources which supplement its own productivity. Significant bibliographies produced by decentralized MEDLARS search centers will be made available to all units of the network.

A Bibliography Coordination Program will have two functions:

- a. to collect unpublished bibliographies including copies of MEDLARS bibliographies prepared in other medical libraries and elsewhere in the scientific community; to announce these bibliographies in a new periodical publication, Bibliography of Medical Bibliographies; and to provide photocopies of the bibliographies on request;

- b. to establish a register of bibliographic projects in progress.

The NLM will collect information from granting agencies, and from wherever bibliographies are prepared. Periodic announcements will be published as part of the Bibliography of Medical Bibliographies.

The Five-Year Health Information Clearinghouse Program Objectives are:

- To develop local accessibility to selected forms of unpublished informational resources valuable for the progress of medical research and education;
- To increase the capability of the medical library and information network to serve a larger variety of existing needs.

Implementation of the Clearinghouse Program will commence with detailed planning for some sub-programs in FY 1967, with further planning and limited pilot operations in FY 1968 and full operation FY 1969 - 1971.

B. Health Communications Systems Referral Service

As specialized information activities increase in number, it becomes increasingly difficult for the potential user to identify those programs which are engaged in activities related to his specific requirements. There is a critical need for the establishment within the PHS of one single point of entry into the large and rapidly growing number of specialized information systems of the PHS and other public and private organizations. The NLM currently maintains awareness files on specialized biomedical systems. It is logical that this function be expanded in scope and service so that the NLM will be able to provide referral services on request.

Among the categories of communications activities to be included are:

- a. specialized science information centers;
- b. medical and research libraries;
- c. medical publication and prepublication systems;
- d. new learning resources under development; medical film, TV, radio, computer-aided instruction, etc.;
- e. ongoing research and development in the information sciences of significance to medicine;
- f. medical records systems.

It should be noted that the National Science Foundation is currently supporting a National Referral Center for Science and Technology in the Library of Congress.^{35/} The NLM Health Communications System Referral Service would be responsible for collecting information on a broader base than that of publication and report resources. It would cooperate with the NSF National Referral Center by sharing with it information in the NSF sphere of interest.

Objectives of the Five-Year Health Communications Systems Referral Service Program are:

- to provide users of medical information with a central point of entry into the multiplicity of resources, systems, and services available to them;
- to provide a central point of reference for PHS and other governmental program officials concerned with medical communication.

This program will be initiated in FY 1967, and will be fully operational in FY 1968.

EXTRAMURAL SUPPORT FOR NETWORK DEVELOPMENT

VII. EXTRAMURAL SUPPORT FOR NETWORK DEVELOPMENT

The National Library of Medicine's responsibility, in the national effort to improve the total health of the people,^{36/} is a large one. All medical libraries share this responsibility. On the occasion of signing the Medical Library Assistance Act of 1965, President Johnson said:

"This creative process (of knowledge expansion) cannot go on unless the results of scientific work are available to practicing physicians and to health workers across the country. The Nation's medical libraries are a vital link between medical education, practice and research...This measure provides long needed support for our medical libraries."^{37/}

The Act, which authorized \$105 million over a five-year period to help build and renovate health-science libraries and to train library personnel came at a propitious time. It permits the National Library of Medicine to move ahead with planning the biomedical library network to strengthen the "vital link between medical education, practice and research."

Under the authority of the Act, the NLM has developed a blueprint for network development which will provide support for:

- A. library construction
- B. improving and expanding basic library resources
- C. research and development
- D. manpower development
- E. publications

F. development and continuing operation of regional medical libraries

The NLM plan calls for the development of a network founded on existing medical libraries, external to but inter-related with the development of control functions in NLM itself. This will be a dynamic relationship over the five years. The Library's extramural programs reflect a means for identifying functional growing elements of the existing medical library complex, present mechanisms for improving existing components and introducing new ones, and for coordinating participating elements as they are developed.

Those elements external to NLM will be developed through the established extramural mechanisms of support of the Public Health Service.^{38/} These mechanisms permit continued self-determination on the part of the non-governmental institution with the responsibility in the acceptance of Federal support to meet certain terms and conditions of grants and awards designed to meet national health goals. This relationship permits the blending of Federal and non-Federal capability for the mutual achievement of important national goals without necessarily distorting the basic mission of either institution. As a by product of Federal support, the non-governmental sector has been strengthened to achieve its own individual purposes.

A. Facilities

The total cost for library construction for medical, dental, osteopathic and public health schools, has been estimated to be over \$100 million for the next five years.^{39/} Section 393 of the Medical Library Assistance Act

authorizes the appropriation of \$10 million for construction for each fiscal year from 1967 through 1970 with a Federal matching rate of 75%. In reviewing grant applications for construction, consideration will be given to the relative effectiveness of the proposed facilities in meeting demonstrated needs for additional or improved medical library services and priority will be given to applicants for the construction of facilities for which the need is the greatest. The term "construction" may include construction of new buildings and the expansion, remodeling and alteration of existing buildings, including architects fees, but not including the cost of acquisition of land or off-sight improvements, and may also include the equipping of such new buildings and existing buildings whether or not they are expanded, remodeled or altered, for use as a library and may include the provision of automatic data processing equipment. Assistance for the construction of approximately 50 libraries is planned over the next five years.

A 1964 study by the Association of American Medical Colleges,^{40/} for the NLM, provided qualitative criteria for the establishment, operation, support and functions of libraries in medical schools. The Library contracted with the Association of American Medical

Colleges, in January 1966, to develop criteria and planning guidance for the construction of medical libraries. The new study will devote special attention to the role of the medical library as a learning resource, considering facilities for use and dissemination of audio-visual and other non-print material.

The information from the 1966 study, supplemented by the criteria reported in the 1964 study, will provide guidelines for effective implementation of the medical library construction grant program.

A Facilities and Resources Committee of non-Federal consultants has been established to provide initial review and make recommendations to the National Advisory Medical Library Assistance Board on construction, resources, and regional library grant applications and to exercise continued surveillance over the broad area of medical library facilities and resources and to recommend measures for appropriate Federal action to assist in meeting needs which are identified.

B. Resources

Support for acquisitions of books and journals is a major need in almost any biomedical library.^{41/} Thus far no support program of the Federal

Government has met this need in the biomedical field adequately.

The NLM five-year plan provides a program of grants-in-aid, to public or private non-profit medical libraries and related scientific communications instrumentalities, for the purpose of expanding and improving basic medical library resources.

The uses for which grants made for resources may be used include, but are not limited to, the acquisition of books, journals, photographs, motion pictures and other films, and other instructional materials; cataloging, binding, and other services and procedures for processing library resource materials for use by those who are served by the library; acquisition of duplication devices, facsimile equipment, film projectors, recording equipment, and other equipment to facilitate the use of the resources of the library by those who are served by it; and the introduction of new technologies and methodologies in medical librarianship. The amount of the grants will be related to the annual operating experience of the library for the last complete fiscal year and will decrease regularly in amount annually for a five-year period. The purpose of this approach is (1) to make a significant but relatively short-term grant to bring basic resources to a more useful level, and (2) to encourage increased support to the library by the parent institution on a continuing basis to compensate for the decreasing federal contribution. The amount of the initial grant will be approximately 25% of the operating library budget of the applicant institution.

While the amount of the resource grants will be determined by a formula, the basis for approval will be the merit of the plan set forth for the

provision of services utilizing the resources to be obtained with the grant. Before awarding such grants the scope of the services provided and planned by the medical library or related instrumentality will be carefully examined and account will be taken of the numbers of graduate and undergraduate students, physicians and other practitioners, medical scientists and faculty, hospital personnel and others who will require the services of the library. The services and resources of the applicant, both existing and proposed, will be viewed in the context of the geographic area served by the library along with the services and resources provided by other medical libraries or related instrumentalities within the area. In this way, planning for total coverage by library services will be stimulated at all interrelating levels, viable libraries can be identified and strengthened, and library service can be generated and supplied for user groups not adequately covered. This will involve an evolutionary development, sorting out and strengthening of individual, local medical libraries of various sizes and affiliations.

A guiding principle of the resources grant-in-aid program is to provide a means for optimizing materials and techniques which are available, for improving and augmenting to make them more useful, and for instituting service patterns that will bring to the individual user, through one means or another, the information he needs. A further guiding principle in the planning of this support program has been to attempt to reach as large a number of libraries as possible, which are capable of providing a useful and necessary service with grants of sufficient size to make an impact.

It is, therefore, planned in the first year of the program to reach approximately 150 medical libraries with some support for improving and expanding basic resources. Additional libraries will be added annually so that at the end of five years, approximately 1,200 libraries would have experienced some assistance through this program and 1,500 by 1971. In the initial year of the program, the maximum grant will be \$20,000 and institutions which cannot qualify for at least \$1,000 grants will be automatically eliminated.

The planning of strong interlibrary relationships will be actively encouraged by the selection of grants to be awarded and a financial incentive built into the program to encourage actual amalgamation of libraries where appropriate and advantageous. Responsible administration of the program dictates the necessity for the investigation of many problems relating to the optimum response of libraries of various size and location to user needs. Such questions will be dealt with under the research and development program and as new information emerges, necessary modifications of the resources support program, particularly, will be instituted. As resources improve, user patterns and service patterns will change and the new information being generated by the research program will reflect this activity. The regulations and policies developed for the administration of the resource grants^{42/} and the nature of the PHS extramural techniques^{43/} are sufficiently flexible to accommodate to such changes and continuing realignment of function of the grantees.

By 1971 the essential components of a national system of interrelated libraries will have been identified, and major expenditures for the introduction of advanced technology for linkage and transmission^{15/} among the components can be undertaken.

C. BIOMEDICAL COMMUNICATIONS PROJECTS:

1. Research and Development, Publications and Special Scientific Projects

The plan for support of research and development in medical library science and related fields is based on the premise that the information resources of the nation's biomedical libraries must be made available to health practitioners, scientists educators and students in ways which are commensurate with their greatly intensified needs in terms of urgency, variety and volume.^{22/} In exploring systems to meet these needs, account will be taken of the severely limited time available which the physician and others may have to devote to finding, collecting, digesting and evaluating medical information, the unique communication problems of the medical community, and the consequences to the health of the people of the failure of the timely delivery of reliable information.

Qualitative and quantitative data relating to a variety of user needs, but particularly those of applied medical science or clinical practice, are necessary to optimize what is available today and to design effective information services for the future.^{15/}

Grants for research and development, publications and special scientific projects would include: Acquisition, organization,

processing, preservation, packaging, retrieval, communication, and usage of biomedical information. Examples are:

- a. Projects in the nature of the communication process including behavioral studies of the originator and user of biomedical informational material.
- b. Projects on the evaluation of the effectiveness of biomedical information facilities (including libraries) in supplying the needs of users.
- c. Projects on the assessment of the varying needs of the scientist, practitioner, student, and other health-related personnel for biomedical information from any source.
- d. Projects on practices and procedures for meeting the demands made on biomedical libraries and other information centers.
- e. Projects on terminology, nomenclature, classification, development of thesauri, linguistics, and epistemology as they relate to biomedical information.
- f. Projects to investigate factors affecting the patterns of the location, flow, and utilization of information related to the design and operation of biomedical libraries and other information centers.
- g. Projects directed at the most efficient configuration of resources and biomedical information traffic patterns.
- h. Projects directed to the design of biomedical information networks and communication systems among biomedical information centers and the relationship of national, regional, and local libraries in these networks.

- i. Projects on the role of the library and its resources in continuing education.
 - j. Projects proposing studies on primary and/or secondary biomedical publications per se, including their development, growth, present status, utility, and future trends.
2. Improving the Bibliographic and Physical Access to the Published Literature and Its Transmission to the User.

The volume and character of the published biomedical literature are such as to pose peculiar problems of storage, retrieval, and transmission of the information it contains.^{6/} Techniques are available which, if applied to these problems, could greatly facilitate the efficient storage, rapid and complete retrieval, and transmission of information to the ultimate ^{22/12/}user. Investigations into such areas as the utility of micromedia, application of automatic data processing techniques to indexing and abstracting, and development of more effective search methods are central to realizing the potentialities of making existing information more readily available to the biomedical community.

In addition, individual scholars who could utilize the extensive collections of the National Library of Medicine or other large research libraries to synthesize existing information and contribute new information in preparing comprehensive analytical reviews and studies in their specialized fields should be supported. There is a great need for this type of approach to health problems and very few opportunities are available for scientists to devote an extended

period of time to a thorough review and analysis of the total scientific record available on a particular subject. The results of such projects would enable numerous other investigators to avoid much painstaking and time-consuming research.

The efficient communication of biomedical information to the health science community also requires re-publication of information in forms other than original journal articles^{44/}. Translations, bibliographies, abstracts, indexes and critical reviews are examples of the types of services which are needed. The National Library of Medicine has supported such publications for several years^{45/}. The Medical Library Assistance Act authorizes the Library to expand these activities and relate them more closely to other areas of support.

Such Grant applications should include:

- (1) The introduction, function, and development of new systems technologies and techniques, in biomedical information centers.

Examples are:

- a. The effects of such systems on manpower utilization.
- b. The design of computer-based storage and retrieval systems.
- c. Man-machine relationships in the systems.
- d. Machine indexing, abstracting, translation, character sensing and recognition, graphic image storage and retrieval, search strategy, systems evaluation, development of new input and output media.

- e. The application of automatic equipment to cataloging, acquisition, and other operations of the biomedical library.
 - f. Performance of libraries, including cost for introduction of computer-based systems.
 - g. New technologies, media, and materials for photoduplication, microstorage, preservation, storage, binding, and processing, and dissemination of biomedical information collections and comparative evaluation of these new technologies, media and materials.
- (2) Research of noncategorical or multicategorical nature in the history of the life sciences with special reference to the history of medicine, especially as it relates to social, cultural, and scientific advances.

Examples are:

- a. Interdisciplinary historical studies; biographical studies; histories of American medical legislation; histories of medical cults; general historical studies of medical and related research; histories of medical journalism; historical studies of primitive uses of drugs and other therapeutic and prophylactic practices; historical studies on the philosophic bases of medicine; histories of medical missions from the nonreligious viewpoint; medical histories of various geographic areas such as foreign countries and the various regions of the U.S.; histories of medical education and practice; studies on the influence of early European medicine on the development of American medicine.

- b. Experiments in the application of quantitative methods to historical research in medicine; oral histories of eminent contemporary scientists, physicians and other individuals; surveys of the collection and preservation of historical materials by various universities, libraries, government agencies, etc.
 - c. Studies of the collection and preservation of archival material by laboratories, research institutions, universities, etc.; cataloging, editing, and indexing of medical historical material.
- (3) Preparation and/or publication of single or serial publications which pertain to scientific work of interest to research scientists, health practitioners or medical librarians and other health communications specialists, including:
- a. bibliographies, critical reviews, handbooks (such as atlases, catalogs, data compendia, dictionaries, directories and manuals), indices, abstracts and monographs;
 - b. translations;
 - c. primary publications in the categorical fields of interest to NLM, e.g., librarianship, information science, medical bibliography, etc.

D. Manpower Development

Under the National Library of Medicine Extramural Program to assist in the training of medical librarians and other information specialists in the health sciences, grants can be made: (1) for postgraduate traineeships and fellowships in medical library science and related fields; (2) for traineeships to update and perfect the skills of librarians or other information specialists in the health sciences; (3) for assisting in developing, expanding, or improving training programs in medical library science and related fields; and (4) for assisting in the establishment of internship programs in established medical libraries meeting standards prescribed by the Surgeon General.

Simply adding more schools which offer courses in medical bibliography will not meet needs for qualitative training. What is needed are training programs which go beyond the basic traditional training in library science and provide the student with an educational experience that combines further theoretical depth with either research or practical experience all directly related to the problems of medical science. Then, and only then, will individuals be developed who can assist the medical scientists and practitioner with his communication and information problems. Rapid retrieval of drug information, continuing education of the physician, provision of regional services,

library services to specialized information centers such as those in Parkinsonism, brain research, diabetes, cardiovascular disease are the types of services needed. The medical library will no longer be limited to books and journals^{7/}, but will be responsible for servicing the newer instructional media in use or to be put into use in the near future. The health museum, medical illustration, and even possibly patient and laboratory records have all been suggested for possible inclusion in learning resource centers of the future. Medical libraries in the 19th Century sense will no longer be sufficient. Medical science information centers broadly conceived and functioning will be required in modern health sciences complexes.

The NLM will give priority to the broad support of a carefully selected limited number of training centers for excellence located in schools of library science or other professional or graduate schools to establish comprehensive interdisciplinary training at the graduate level for individuals desiring advanced training in preparation for careers in health science information services. Special emphasis will be given to the planning of medical information systems. The training environment will draw heavily on various disciplines, particularly the biomedical sciences, and also mathematics, systems engineering, linguistics, and library science. Such training activities will be developed in conjunction with strong

biomedical programs so that the scholarly research pursued by the graduate students in medical library or information science can be conducted in the actual environment which they seek ultimately to serve.

It is envisioned that 6 or 7 such training centers will be supported utilizing the training grant mechanism which would provide for faculty support as well as stipends for graduate students, including post-doctoral fellows and other expenses incident to the training program.

In addition to this type of advanced training, the NLM will support medical library internships. The present library graduate from the traditional 5-year programs has rarely had any exposure to a medical library, having had possibly only a course in medical bibliography. The intern is supported for a full year of practical as well as further theoretical instruction. Such internship training will be carried out in some cases in medical school libraries, in others, in large teaching hospital libraries or, in certain instances, in medical society libraries that serve extensive areas of the medical community.

Support for the retraining of medical librarians is also planned. This will be done in conjunction with the training centers identified in the first category of training described above or in the centers offering internship training, or in other environments which will meet the specific needs of the individual to upgrade his competence, particularly in the newer communications methodology. With the rapid advances being made in the management and processing of biomedical information, many medical librarians currently practicing their profession find that they are not able to take full ad-

vantage of these new techniques because of deficiencies in their training. In order to utilize this pool of experienced manpower to the fullest in the future, it will be necessary to inaugurate programs for retraining librarians in new developments in the field.

It is essential that traditional methods for training biomedical librarians and other personnel involved in providing health science information services be critically examined in the future and new courses and expanded curricula developed. Support will be extended to those institutions wishing to conduct serious experimentation to arrive at more thorough and effective training plans in medical library service and to add additional faculty competence in the medical field to library schools.

A Manpower and Training Committee, has been established for initial review of proposed training programs. The Committee is composed of non-Federal consultants representing various elements of medical library and information science. Rigorous criteria for the selection of training programs for support will include: the competence of the program director and staff; their availability to the trainees; the training program proposed; the facilities and resources available for the students; and the calibre of prospective and past trainees, and their commitment to careers in biomedical communications.

The NLM five year plan calls for the support of an average 100 trainees annually although some trainees would continue for 2 or 3 years of training.

E. REGIONAL MEDICAL LIBRARY GRANT PROGRAM

The Regional Medical Library Grant Program provides financial support to existing public or private non-profit medical libraries to enable each of them to serve as the regional medical library for the geographical area in which it is located. The purposes of this program are:

1. To ensure the equality of access to the documents comprising the scientific record of medicine by all professional workers in the health fields.
2. To improve the quality of access to these documents in terms of speed and ease and thereby ensure the widest dissemination of research results and their application to health practice.
3. To avoid the necessity of costly duplication of extensive collections and lessen competition for library materials now in short supply.

One of the distinguishing features of the library community generally, and particularly of the medical libraries, has been a tradition of free sharing of resources. It has been the rule that the scientific record should be available to all having need of it. Except for a few institutions which have legal obligations to share their holdings, (e.g., the National Library of Medicine), libraries have been motivated solely by a spirit of cooperation. This sharing has been largely accomplished by the interlibrary loan and, more recently, by photoduplication techniques. Orr and Pings^{5/} have recently studied the interlibrary loan traffic between biomedical libraries in detail. They have concluded that the interlibrary loan system

is under great strain and is "critically unstable." This situation is a result of a rapid increase in the volume of interlibrary loan traffic (about 10% per year) and the fact that it has no financial underpinning except regular library budgets which are uniformly inadequate to satisfy even local needs. It is likely that there will be a continuing increase in medical research. The emergence of tools such as MEDLARS will increase bibliographic access to the biomedical literature. The requirement for greatly increased and strengthened facilities for document retrieval to meet these needs is evident.

It is estimated (Orr and Pings)^{5/} that the National Library of Medicine supplies from its own collection about 15% of loans in the medical field in the United States. There are a few other "large lenders" in the country, which together supply a relatively large proportion of the documents. Some of these are the New York Academy of Medicine, the Library of the College of Physicians of Philadelphia, the University of California at Los Angeles, Biomedical Library and the Harvard Medical Library. In addition to these, there have emerged arrangements whereby, for example, biomedical libraries of the Universities of Wisconsin, Nebraska, and Kentucky have assumed the responsibility of acting as regional libraries providing services to wide areas. A formalized statewide plan for the sharing of resources is being implemented in New York. Other cooperative agreements are being concluded in mutual efforts to reduce costs and keep the system viable.

The Medical Library Assistance Act provides authority for the support of regional health science libraries through a program of grants to existing

libraries.

A "region" may be defined as an area composed of any part or parts of any one or more states that forms an economic and socially related region, taking into consideration such factors as, location and extent of communication facilities and systems, presence and distribution of educational and health facilities and programs, distribution of health-related manpower, and other activities which justify the establishment and operation of a Regional Medical Library.

The regional services provided by the libraries selected will be fully supported by the grant. Funds may be provided for the acquisition of library resources and materials, and for procedures for processing and handling such resource materials for use by those served by the library, for acquisition of duplicating and transmission devices and other equipment to facilitate the use of the resources, the employment of personnel to insure the transmission of materials and information from the regional to the local library.

NLM-supported regional libraries will assume responsibility for providing bibliographic services for users in the region. An essential component of the regional library will be a MEDLARS search center. Such centers will function by providing searches and bibliographies from centrally generated magnetic tapes, which will be given to the regional library without charge by the NLM. Existing computer center facilities will be used for such purposes as well as for the automation of such library functions as acquisitions, the serial record, the catalog, circulation, and other library procedures.

Each regional library should be concerned with research on better methods for accomplishing all aspects of its mission and with training personnel involved with the operation and use of the system.

Grants would be made for a stated period of up to five years and grantees would be required to enter competition for renewal at the end of that period.

In addition to machine bibliographic service, the regional library will render the traditional bibliographic services when requests are of an unusual nature, or when they place undue demands on the resources of local libraries. The provision of documents without charge to users within the area served will be a responsibility of the regional library. This function pre-supposes a collection of sufficient size and scope to permit filling of most of the requests received. Documents may be provided in the original or in photocopy.

In addition to the above functions, the regional libraries will be expected to give the widest possible dissemination to information concerning its resources and services. This would include the publication of bulletins announcing its recent acquisitions, specialized bibliographies which it has prepared, lists of serial titles received, and other materials which would assist its users in their local libraries. The regional library would be expected to provide specialized material for use in various mission-oriented programs being conducted in the area being served. (III).

Consistent with a policy of self-determination, administrators, librarians, and users from the schools of the health professions, the practicing medical community (e.g. hospital libraries, medical and dental society libraries), state and local governmental health agencies, voluntary health agencies, research institutions, specialized scientific information centers are being encouraged to meet together to determine the natural and feasible service configuration of their "region" or area. Discussions with potential neighboring areas are encouraged, so that when all of the regions are ultimately identified and, there will be, insofar as possible, complete coverage of all users of medical library services in a total national network.

The extensive planning on the part of each regional library for the provision of services throughout its region will require an examination of the user requirements of its region as well as the resources and facilities which exist and the services which can be provided by the local libraries.

It will be possible to select with considerable confidence the first few regional libraries for support on the basis of general excellence, identifiable service requirements of certain areas ability to provide services to regional medical programs, and the size and nature of the population to be served.

NLM's INTERNATIONAL ROLE

The NLM International Role

The National Library of Medicine's program for acquisition of the world's medical literature has been an active one for more than a century. Obtaining published medical information from institutes in foreign countries has been accomplished bilaterally, multilaterally and in cooperation with other agencies by purchasing publications, when necessary, and on an exchange basis when possible. The indexes based on these publications have been distributed to all countries where they constitute a universally recognized international standard.

The Surgeon General, in 1963, delegated additional international responsibilities to the NLM. The Library was given authority "to act as a principal resource within the Public Health Service for the improvement of the international exchange of published biomedical information through extramural support for the translation of foreign journals, monographs, critical reviews, announcement services, handbooks, data compendia, abstracts, indexes, and so forth, and distribution of these translated materials to the American biomedical community."^{46/}

The NLM programs carrying out activities related to the NLM's international role are: Translations; Abstracting and Indexing Services; Literature Reviews, and Training.

Program plans for the next five years include:

1. Translations: The NLM is currently supporting translation activities

in Poland, Yugoslavia, and Israel which are producing valuable publications for the NLM collection. The Library is investigating the possibilities of obtaining translations from other languages as required. In order that there may be a central depository for translations, the Library will set up the clearinghouse function described in Section VI of this plan. Ways of making translations more readily available through its clearinghouse and announcement services will be explored.

The Library will study the timeliness, quality, and coverage of its translation activities, to ensure that the efforts devoted to this program are being used to best advantage. Professional advice will be sought on selection of journals and monographs to be translated, so that subject areas of most relevance to the U. S. biomedical community are covered.

2. Abstracting and Indexing Services: The Library supports a number of abstracting and indexing services, many funded by Public Law 83-480 funds. Examples are the Drug Digests, Drug Toxicity Abstracts, and Oral Research Abstracts. These programs are undergoing evaluation by the biomedical community and will be expanded and strengthened accordingly. New programs will be initiated in response to emerging needs. For example, the abstracting service will be used to provide input to the mechanized abstract retrieval system described in Section IV, D, 6.

3. Literature Reviews: The Library will expand its support of the preparation of critical review papers based on the international literature. It will encourage the submission of proposals from scientists of proven

competence, and support those which show most evidence of quality production. These programs will be funded from Public Law 83-480 funds wherever possible.

4. Exchange of Publications: Certain publications needed for the NLM collection can only be obtained through exchange with other institutions. The NLM can offer for exchange its duplicate material as well as its own publications to help satisfy collection needs of other institutions. The publications exchange program will be expanded.

5. Sale or Exchange of MEDLARS Tapes: The Library plans to encourage bilateral agreements which will make the unique searching capability of MEDLARS available to institutions in other countries, which possess hardware and backup library services.

6. Interlibrary Loans: One request in six for loans of Library material originates from foreign countries. The NLM will develop and expand interlibrary loans in cooperation with international programs, conducted by AID and other public agencies, private organizations, and foundations.

7. Resource Building: The Library will work closely with international organizations such as the World Health Organization and the Pan American Health Organization to develop regional biomedical communication centers outside the United States. When requested, and where feasible, the Library will provide technical consultative services to interested foreign institutions.

8. Training of Personnel: The National Library of Medicine will expand existing, and develop new programs to train personnel from other countries to help alleviate the world-wide shortage of medical library personnel and other information specialists.

The NLM training activities will be accelerated and consolidated into a mission-oriented unit under the coordination, guidance, and management of a Training Officer, with staff assistance. Development programs can thus be implemented with the assurance of maximum cooperation among the Library's operating officers to provide the trainee with maximum opportunities for learning.

The Five-Year International Program Objectives are:

1. To support public and agency programs of sharing and disseminating information internationally for the benefit of world medicine.
2. To improve the flow of the world's published biomedical information to U. S. scientists;
3. To maintain and strengthen translations, abstracting, indexing, review, and other programs which fulfill this aim;
4. To establish a clearinghouse which will accelerate dissemination of biomedical translations;
5. To develop a strong consolidated training program.

Five-Year Budget Plan (Table 3)

The National Library of Medicine's five-year budget and personnel requirements are contained in the table appended to this section.

A. 1968 Budget

The NLM's budget request for FY 1968 is \$29,454,000, an increase of \$10.2 million over FY 1967. The principal increase is \$7.2 million for extramural grants and contracts. The total of \$20.75 million for extramural grants and contracts in 1968 will bring the funding for each of the seven financial assistance programs authorized by the Medical Library Assistance Act of 1965 up to the authorized ceilings contained in the Act. The only exception is the request for special scientific projects where the total authorized will not be requested until FY 1969.

The FY 1968 budget for direct operations provides an increase of \$2.8 million over the FY 1967 base. This increase is required to build up the internal operating programs of the Library, thus enabling the Library to fulfill its responsibilities as the keystone of the national biomedical library network. Reprogramming and conversion to a new computer system will be completed and installation of the new computer equipment will occur in FY 1968. The Library will: increase the volume of literature indexed for input into the MEDLARS system; improve and expand the list of Medical Subject Headings (MeSH); increase the number of recurring bibliographies prepared; provide a greater number of demand search services; increase

support to decentralized MEDLARS search and retrieval centers; and expand the MEDLARS evaluation effort. The more traditional direct library services activities will be bolstered to keep abreast of an ever-increasing workload. The History of Medicine program will receive increased support enabling it to acquire and organize some manuscripts, personal papers, tape-recorded interviews, and correspondence pertaining to important developments in medicine. A significant effort will be made to fill gaps in the Library's collection to enable it to meet fully its national resource responsibilities and effectively service the national medical library network. Further automation of technical services will take place. The Library will also continue to work toward the development of an advanced graphic-image storage and retrieval system and will undertake a greatly expanded program of microfilming its collection for preservation purposes.

B. FY 1969-1971 Budgets

The National Library of Medicine's budget will increase by \$1.0 million per year in FY 1969 and FY 1970 in order to provide necessary expansion of the intramural activities.

In FY 1971 the budget will total \$43.7 million, an increase of \$12.2 million over 1970 and \$14.2 million over 1968.

The budget for 1971 assumes that the Medical Library Assistance Act will be extended beyond its 1970 expiration date and that appropriation ceilings will be increased. The total of the annual authorizations for the seven financial assistance programs authorized by the Act will be increased \$8.5 million, from \$21 million to \$29.5 million beginning in 1971.

The Library's budget for direct operations will grow from \$8.7 million in FY 1968 to \$14.2 million in FY 1971. The principal element of increase will be \$3 million in FY 1971 to operate the new NLM Branch and Center for Biomedical Communications. The remaining \$2.5 million increase will be required for the Library to perform its responsibilities to the national biomedical library network, to expand the scope of its activities beyond the published literature through operation of the National Health Information Clearinghouse and Referral Program, and to conduct intramural research and information systems development.

C. Buildings and Facilities Budget

\$900,000 for planning the NLM Branch and Biomedical Communications Center will be required in FY 1968. Construction and equipment costs are estimated at \$4.0 million. \$2.0 million, the maximum authorized by the Medical Library Assistance Act of 1965 for an NLM Branch, will be needed in both 1969 and 1970 for construction of the new Center for Biomedical Communications. \$5.0 million additional will be required in 1971 under a higher authorization in the extension of the act.

\$250,000 in planning funds in 1968 and \$2.5 million in construction funds in 1969 are required to design and build an Annex on the site of the NLM in Bethesda.

X FIVE-YEAR PLAN BUDGET (Table 3)

(in thousands of dollars)

Operating Budget	1967		1968		1969		1970		1971	
	President's Budget		Preliminary		Estimate		Estimate		Estimate	
	Pos.	Amount	Pos.	Amount	Pos.	Amount	Pos.	Amount	Pos.	Amount
Extramural Grants and Contracts										
Research		1,500		3,000		3,000		3,000		5,000
Special Scientific Projects		120		250		500		500		500
Training		1,000		1,000		1,000		1,000		2,000
Construction		7,500		10,000		10,000		10,000		12,500
Publication Support		780		1,000		1,000		1,000		1,500
Library Resources		2,700		3,000		3,000		3,000		5,000
Regional Medical Libraries		---		2,500		2,500		2,500		3,000
Total, Grants and Contracts		13,600		20,750		21,000		21,000		29,500
Direct Operations										
Library Operations	346	5,016	417	7,859	441	8,657	485	9,562	485	10,211
Center for Biomedical Communications		---		---		---		---	50	3,000
Review and Approval of Grants and Contracts	28	615	50	845	59	883	65	923	65	1,008
Total, Direct Operations	374	5,631	467	8,704	550	9,540	550	10,485	600	14,219
Total, NLM	374	19,231	467	29,454	550	30,540	550	31,485	600	43,719

BUILDINGS & FACILITIES BUDGET		1967	1968	1969	1970	1971
NLM Center for Biomedical Communications	---	900 (Planning)	2,000	2,000	2,000	5,000
NLM Annex	---	250 (Planning)	2,500	---	---	---

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APPENDIX

ADVISORY REPORT ON POLICY FROM THE BOARD OF REGENTS
OF THE NATIONAL LIBRARY OF MEDICINE
TO THE SURGEON GENERAL OF THE
UNITED STATES PUBLIC HEALTH SERVICE

GENERAL POLICIES

1. The National Library of Medicine should be responsible for collecting, organizing, processing and distributing recorded information relevant to human health, serving as the primary national resource for these functions.
2. The National Library of Medicine should be the central repository and the coordinating agent for the multiple specialized information centers designed to meet categorical information needs related to human health.
3. The National Library of Medicine should be the heart of a national biomedical information system which is designed to function as a component of a future national science information network.
4. The National Library of Medicine should be responsible for the research, organization, development and coordination necessary to the evolution of a more effective decentralized national system for the dissemination of information in medicine and related fields.

These general policies are consistent with the characteristics of the National Library of Medicine:

1. The greatest repository of medically related information in the world is contained in the National Library of Medicine and its capacity to disseminate this information is unequalled.
2. The National Library of Medicine functions as the capstone of our present system of medical libraries and has well established interlibrary relationships for exchange and sharing of its collections.

3. The National Library of Medicine has been in the forefront internationally in placing into operation advanced systems of information processing suited to serve students, investigators and practitioners in the broad fields of knowledge related to human health.

4. The mission orientation of improving human health gives unique quality to the National Library of Medicine, setting it apart from information systems concerned entirely with physical events or with general knowledge.

5. The rising expectations of the American people for greater access to comprehensive health service gives pressing urgency to the need for the National Library of Medicine to respond more effectively to the rapidly increasing demands placed upon it by both public and governmental agencies.

OPERATING POLICY

There are six areas of operating policy, within the context of general policy, which deserve specific statement:

- I. Service
- II. Technical Standards
- III. Research and Development
- IV. Education and Training for Library Personnel
- V. Library Resources for Education in the Health Professions
- VI. Medical Information Network of a National Science Information System

I. Service

The National Library of Medicine has functioned by giving its services in the public interest to governmental and non-profit agencies, organizations and institutions or alternatively upon a loan, exchange or charge basis.

Medical libraries throughout the country, historically structured in the "free public library" pattern, because of increased demands and under-support in recent years, have been compelled to make charges for library loan and reference services. Assuming no legal impediments, the following service policies should be given effect:

1. Access to the Information in the National Library of Medicine should be available to all qualified users* without charge as a public service.
2. The National Library of Medicine's services should be viewed as part of the total responsibility of the Federal Government for the health of the people.
3. All cooperative service programs between the National Library of Medicine and other agencies, institutions or organizations should reflect these service policies. As such a national resource, it can and should play a major role in supporting and improving both basic and continuing education of the health professions by providing information and communication resources essential to the educational process.

II. Technical Standards

Multiple subsystems will compose the ultimate national science information system. The concern with human health identifies the national subsystem which should have the National Library of Medicine as its center. Technical standards must give primary attention to the real functions of the subsystem while assuring that it will have effective linkages to and be an integral part of a national science information network. The

*All elements of the educational research and professional communities concerned with the national health effort.

following policies for establishment of technical standards should be given effect:

1. The National Library of Medicine should be the representative and agent for the biomedical information system in all efforts to standardize communication modalities on a national or international scale.
2. The National Library of Medicine, with appropriate technical advice, should have the responsibility for determining the communication modalities and technologies most suitable for the subsystem serving students, researchers and practitioners concerned with human health.
3. The National Library of Medicine should have the responsibility for assuring that to the fullest extent consistent with serving the needs of the health related workers, its information system will be compatible and/or convertible with the modalities and technologies selected for federally supported information subsystems in other fields of science and library practice.

III. Research and Development

The National Library of Medicine has demonstrated its effective concern with introducing new and improved means of information processing. Current demands by users of biomedical information are heavily moderated by their preconceptions of the difficulty of locating and retrieving an item, thus even the heavy current demands do not reflect the actual need for information. The present system, however, is not without value and is a suitable substrate for the evolution of a system designed to meet actual needs rather than simply react to current demands. The objective of research and development

under the aegis of the National Library of Medicine should be:

1. To develop models of advanced systems for acquiring, codifying, indexing, cataloging, abstracting, storing and disseminating recorded information.
2. To accelerate and guide the adaptation of these models to a decentralized national system which utilizes the existing biomedical libraries as its framework.
3. To determine the nature and extent of user needs and the acceptability of new modalities and technologies to the students, researchers and practitioners whose informational requirements are peculiar to their respective roles.

To this end the following policy should be given effect:

1. The National Library of Medicine should support experimental programs, both intramural and extramural, to test multiple approaches to meeting the needs for biomedical information.
2. The National Library of Medicine should be a national resource for information systems research and development relevant to human health.
3. The National Library of Medicine should serve as a clearinghouse and coordinating agency for information systems R and D within the Public Health Service.

IV. Education and Training for Library Personnel

There is an urgent need for manpower which will require re-training of existing library staffs, revision of educational programs in schools of library science and the introduction of communications technologists and specialists. Because of its central role in developing and decentralizing models of improved

information processing, the National Library of Medicine will be an important resource for the educational and training programs that will be essential for staffing. In order to give operating reality to its developmental efforts, the following policies guiding education and training should be given effect:

1. The National Library of Medicine should support intramural and extramural educational and training programs relevant to improving biomedical communication systems.

2. Internships, fellowships and exchange of personnel should be available to support the intramural training programs of the National Library of Medicine, with preference given to staffs of decentralized units of the subsystem of which the National Library of Medicine is the center.

3. The National Library of Medicine should make institutional grants to those academic organizations capable of offering sophisticated educational programs to those who will be the new generation of biomedical communications specialists as well as to present librarians who seek re-training.

V. Library Resources for Education in the Health Professions

As a primary national resource for biomedical communications, the National Library of Medicine can and should utilize fully its intramural and extramural programs to foster the optimum utilization and application by the individual health worker of the vast store of existing knowledge in all forms. To achieve this end, the National Library of Medicine should develop and support, directly and through regional and local biomedical libraries, research, experiments, and demonstrations to improve educational techniques enhancing such application and extend new modalities effective in the continuing education of health workers. The Library's educational

mission should, however, not be conceived narrowly. Modalities of education developed for purposes of continuing education are applicable as well to its basic educational mission directed toward students and teachers of medicine, as well as toward researchers.

VI. Medical Information Network of a National Science Information System

The larger extension of communications systems concepts have focused attention on the desirability of creating a National Science Information System. Other government agencies are currently supporting studies relating to the design of such systems in various areas of science and engineering. In this process, the relationships between federal interests, and the interests of the industrial and academic communities are being explored. The fundamental purpose appears to be so to organize information resources and their inter-communication facilities that the results of government-sponsored research and development in the sciences and engineering can be made more readily available for the advance of the economy and the welfare of the people.

While many of these studies are still on the drafting board, the field of health has such a national communication system in being. Historically-evolved, the existing medical library network is in fact a communications system with traditional linkages and long operating experience. In relation to this system the National Library of Medicine has developed a central role through providing the bibliographic apparatus on which the system functions, and guaranteeing the ultimate availability of resources the system requires.

The following policies should be given effect in developing the medical library network of a national science information system:

1. The Federal Government should improve, supplement and strengthen

the existing national medical library system as the basis of a medical information network.

2. The National Library of Medicine's role in development of the medical information network should be to cooperate with the public and private institutions which constitute active nodes in the system, giving special attention to the development of compatible and synergistic relationships between existing and developing modalities and technologies.

3. The National Library of Medicine should assure that new systems will guarantee improved access to health related information by all citizens who have use for it--students, researchers, teachers, practitioners and the general public.

The Board of Regents would, finally, advise the Surgeon General of their concern that the organizational position of the National Library of Medicine within the Public Health Service be such that it can fulfill its mission. The coordinating functions, the role of a clearinghouse and the responsibility for development of technical standards suggest a need for a position in the Public Health Service that involves it directly and continuously in policy decision making.

The present and future responsibilities of the National Library of Medicine imply such major increments in budget, staff and facilities that it would be useful for the National Library of Medicine to be authorized to exercise coordinating and control functions over the activities for which it is responsible. The difference between the mission of the National Library of Medicine at the time it came under the responsibility of the Surgeon

General of the United States Public Health Service and the mission which the Board of Regents has recommended in this advisory statement is so vast that a reassessment of the organizational relationships to other operating units of the Public Health Service seems reasonable. The name National Library of Medicine itself conjures up an archaic and restricted image of the true mission and consideration might be given to establishing a Center for Biomedical Communications within the National Library of Medicine. Such a center would provide the broader base upon which to build the new programs recommended by the Regents.*

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- * The Board is aware that the National Library of Medicine has been concerned for several years with broader communications concepts and potential program responsibilities than those contemplated by traditional research libraries. The following studies and papers serve to illustrate the Library's changing role in relation to the broad problems of biomedical communication:
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The Board of Regents is sensitive to the fact that administrative matters such as the Library's organizational placement fall outside its proper purview and refers to them only to illustrate the nature of its concern for the capacity of the National Library of Medicine to fulfill its mission. In this context the Board of Regents wishes to reaffirm its belief that the National Library of Medicine should be closely linked to the principal national health effort which serves the research, teaching and practicing medical communities.

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